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Chapter 5
Air

5.1 Introduction

This chapter addresses the affected environment, impacts to the environment, mitigation measures, and significant unavoidable adverse impacts related to air for the Brightwater Regional Wastewater Treatment System (Brightwater System). References cited within this chapter can be found at the end of the chapter.

5.1.1 Overview of the Chapter

This chapter has been reorganized from the Draft EIS discussion. The new organization is according to systems—the Route 9–195th System, the Route 9–228th Street System, and the Unocal System—to facilitate comparison among alternatives. For each system, the discussion is organized by system element (treatment plant, conveyance corridor, and outfall). The discussion of conveyance features has been developed in greater detail than in the Draft EIS.

Comments on the Draft EIS regarding air quality were received from state, federal, and local agencies, public interest groups, and individuals. The majority of the comments fell into eight main categories:

- Concern regarding potential odors from operation of the wastewater treatment plant
- Questions regarding the dispersion modeling procedures used and the sources of meteorological and topography data used
- Requests for additional details on the odor control and criteria and toxic air pollutant control technology that would be used for the Brightwater system
- Requests for more information on potential emissions of aerosols from wastewater treatment processes (provided in Appendix 5-A)
- Requests for details on locations of sensitive receptors in relation to potential odor sources
- Requests for details on proposed biosolids trucking procedures and potential for odors from biosolids handling and transport (provided in Appendix 5-A)
- Questions regarding potential construction-related air quality impacts

- Requests for more information on proposed odor control for the portals and other conveyance facilities

The air quality analysis completed for the Draft EIS relied on early treatment plant and conveyance design information and on meteorological data from an offsite location, Paine Field. While this analysis was more rigorous than is typically done for an EIS, King County has refined the analysis further for the Final EIS. Since publication of the Draft EIS, more detailed information has become available on process operation and odor control design. In addition, meteorological stations were installed at both the Route 9 and Unocal sites in July 2002 to gather site-specific data. Nine months of data (July 2002 through March 2003) were gathered prior to the preparation of the Appendix 5-A for this EIS (1 year of data was not yet available when the modeling was performed). In addition, 4 years of meteorological data from Paine Field were analyzed. Two separate model runs were conducted for each site, one using the site-specific data and one using the Paine Field data. By using both data sets, the worst-case data from both meteorological stations were modeled.

This chapter is a summary of the relevant findings and conclusions of the analyses. A full description of the additional technical analyses done for the Final EIS can be found in Appendices 5-A, Odor and Air Quality: Treatment Plant; 5-B, Odor Analysis: Conveyance; and 5-C, Construction-Related Air Impacts: Conveyance.

A brief discussion of applicable regulations and the methods used for the analyses is provided in this chapter to give the reader context for the discussion of impacts; the full description of regulatory background and methodologies is contained in the appendices.

5.2 Affected Environment

This section describes the existing air environment that may affect, or be affected by, the Brightwater System. The air environment includes climate, air quality, and prevailing wind conditions. These factors are important in determining the potential for air emissions and odor impacts, and play an important role in wastewater facility design.

5.2.1 Affected Environment Common to All Systems

5.2.1.1 Treatment Plant: Common to All Systems

Regulatory Environment

Because knowledge of air quality regulations is essential to understanding the impact analysis, this section provides a brief overview of key regulatory concepts.

Appendix 5-A, Odor and Air Quality: Treatment Plant, includes more detailed information on air quality regulatory issues and permitting requirements.

The primary regulation governing air quality in the United States is the federal Clean Air Act (CAA) and its amendments. At the federal level, the CAA is administered by the U.S. Environmental Protection Agency (EPA). In Washington State, EPA has delegated its regulatory authority for air quality to the Washington State Department of Ecology (Ecology) and to regional clean air agencies. The Puget Sound Clean Air Agency (PS Clean Air) is the agency with primary responsibility for Brightwater's air quality compliance.

Several different types of air pollutants are subject to regulation. Under the CAA, EPA has set air quality standards for six principal pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, ozone, and particulate matter. The standards for these "criteria" pollutants are known as the National Ambient Air Quality Standards (NAAQS). EPA also has designated 188 pollutants, which are known or believed to cause human health effects as hazardous air pollutants (HAPs). HAP emissions in excess of certain levels are subject to National Emissions Standards for Hazardous Air Pollutants (NESHAPS). In addition, Washington State regulates a set of toxic air pollutants (TAPs), which include the 188 HAPs and over 400 additional chemicals; the emissions limits applicable to TAPs are known as acceptable source impact levels (ASILs).

These air quality regulations are administered through the issuance of permits to new sources of air pollutants. The permits specify both the level of air pollutants that the new facility is allowed to emit and the technology that must be used to control emissions. In general, facilities that emit larger quantities of pollutants must undergo more rigorous permit processes and install more aggressive control technology than facilities with lower emissions. In Washington State, all new sources must submit a "Notice of Construction and Application for Approval," commonly referred to as a Notice of Construction (NOC) application, that specifies best available control technology (BACT) to limit emissions; wastewater treatment plants that emit over 250 tons per year of any criteria pollutant must obtain the more stringent Prevention of Significant Deterioration (PSD) permit. TAP emissions are regulated as part of the NOC and PSD permit processes. In addition to these state permits, facilities may be required to obtain a federal operating permit under Title V of the CAA if they meet one of the following conditions:

- Emit more than 100 tons per year of any criteria pollutant
- Emit more than 10 tons per year of any one HAP
- Emit more than 25 tons per year of total HAPs

When the thresholds for HAPs are exceeded, new sources must apply maximum achievable control technology (MACT), which is a more stringent level of control than BACT.

Air emissions summaries for each location (Route 9 and Unocal) are found in this chapter and in Technical Appendix 5-A for this Final EIS. These emission summaries were used to evaluate air quality compliance requirements for initial and final buildout wastewater flows for each site. To fulfill the air quality regulatory and legal requirements for the treatment plant, the Brightwater System would be required to get a NOC, but would not be required to have a federal Title V operating permit because it would likely emit less than 100 tons per year of any criteria pollutant and less than 10 tons per year of any single HAP, or 25 tons per year of any combination of HAPs. Both permitting programs are implemented by PS Clean Air and would be addressed when air quality permit applications are submitted.

As part of the NOC application process, new emission sources must also comply with all state and local emission standards. New emission sources of criteria pollutants must apply BACT, and new emission sources of toxic air pollutants must apply best available control technology for toxics (TBACT), as defined by PS Clean Air Agency. Because the treatment plant would not be expected to be a major source of HAPs, federal MACT standards would not be applicable to this treatment plant.

The treatment plant would be required to submit an annual emission inventory to PS Clean Air. The emission inventory would report the annual emissions of criteria pollutants or air contaminants, which include nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), sulfur oxides (SOx), and particulate matter (PM). The treatment plant would also be required to report emissions of TAPs and HAPs. Currently, facilities are not required to report emissions of the greenhouse gases carbon dioxide and methane, but this may change in the next few years if the regulatory agencies adopt specific standards, regulations, or reporting requirements focused on greenhouse gases.

Additional information about potentially applicable regulations, including federal programs, is included in Technical Appendix 5-A of this Final EIS. While the CAA and state and local regulations set standards for criteria pollutants, HAPs, and TAPs, they do not set standards for odors. PS Clean Air regulates odors in the Puget Sound area and enforces local and state law. PS Clean Air Regulation I, Article 9.11(a), Chapter 70.94 RCW and WAC 173-400-040 (4) and (5) address odors and emissions that may be a detriment to a person or property. The PS Clean Air may take enforcement action under this regulation upon proper documentation and identification of the source of odor.

Regional Climate Conditions

The following discussion of general climate conditions is based on information provided in *Climates of the States, Volume 2* (Gale Research Company, 1985), with updates provided by meteorological sites operated by state climatologist programs. The Puget Sound region has a relatively mild marine-type climate. The Puget Sound Lowland area includes a narrow strip of land along the western side of Puget Sound southward from the Strait of Juan de Fuca to the vicinity of the Cities of Centralia and Chehalis, and a somewhat wider strip along the eastern side of Puget Sound extending northward to the Canadian border.

Several factors affect the climate in the Puget Sound region: terrain, the Pacific Ocean, and semi-permanent high- and low-pressure areas located over the north Pacific Ocean. The combination of these factors produces different weather conditions within short distances. Variations in the temperature, length of the growing season, fog, rainfall, and snowfall are due to factors such as distance from Puget Sound, the rolling terrain, and air from the ocean moving through the Strait of Juan de Fuca and the Chehalis River Valley. Occasionally, in the winter season, cold air from the interior of Canada flows southward through the Fraser River canyon and over the northern Puget Sound Lowland.

The prevailing wind direction is south or southwest during the wet season (winter) and north or northwest during the summer. Occasional severe winter storms produce strong northerly winds. The summer months are characterized by moderate temperatures and light, variable winds, which tend to blow from the north. The highest recorded winds in the area are associated with strong storms that cross the state from the southwest in the autumn and winter. The Olympic Mountains buffer the Puget Sound Lowland from the weather that arrives from the Pacific Ocean. The Cascade Mountains and Puget Sound also buffer the area from weather systems moving into the area. The result is mild, wet, and cloudy winters and cool summers. Summer weather is often dominated by persistent high-pressure cells that create stagnant air conditions. This weather pattern can contribute to the formation of photochemical smog, as indicated by ozone concentrations downwind from urban centers.

The average wind velocity within the Puget Sound Lowland is less than 10 miles per hour (mph). Although the Puget Sound Lowland area is the most densely populated and industrialized area in Washington, there is sufficient wind most of the year to disperse air pollutants released into the atmosphere. Air pollution is usually most noticeable in the late autumn and winter seasons, under conditions of clear skies, light wind, and a sharp temperature inversion. Temperature inversions occur when cold air is trapped under warm air, preventing vertical mixing in the atmosphere. Inversions can last several days and can prevent pollutants from being dispersed by the wind. Inversions are most likely to occur during October, November, December, January, and February. If poor dispersion persists for more than 24 hours, PS Clean Air may declare an “air pollution episode” or local “impaired air quality”. PS Clean Air has not declared an air pollution episode in the last 3 years.

5.2.2 Regional Air Quality

The geographic area where the two treatment plant site alternatives are located is the western part of Snohomish and King Counties. This area is currently a maintenance area under the EPA classifications (Puget Sound Clean Air Agency, 2003). The standards for carbon monoxide (CO) and ozone were violated in the past, but are now being met and closely monitored under a State Implementation Plan (SIP) for attainment of air quality standards. Both the Unocal and Route 9 sites lie within the CO and ozone maintenance areas and thus are subject to the requirements of the SIP.

PS Clean Air and Ecology regularly conduct air quality monitoring and record meteorological and air contaminant emission data throughout the Puget Sound region. Four air quality monitoring stations are located within 5.9 miles of the Unocal site and 8.3 miles of the Route 9 site. These stations provide applicable data on local air quality conditions in the project area, but do not provide the additional data needed for dispersion modeling, such as air temperature, relative humidity, solar radiation, barometric pressure, and rainfall. Paine Field was the closest source of meteorological data suitable for the dispersion modeling. In addition to Paine Field, both treatment plant sites have meteorological stations located onsite or on adjacent property (installed in July 2002 by King County). These onsite monitoring stations collect wind speed, wind direction, air temperature, relative humidity, solar radiation, barometric pressure, and rainfall data.

Station locations and parameters monitored at each site are listed in Table 5-1.

The onsite meteorological stations established for the Brightwater project were designed to characterize each site's wind, temperature, and atmospheric stability. These characterizations were used in air quality models to analyze air quality impacts for the Final EIS. The data were collected according to EPA standards associated with PSD requirements for new major stationary sources of air emissions. Specific data for each site are described below under the discussions of site-specific meteorological conditions.

Table 5-1. Air Quality and Meteorological Monitoring Stations on or near the Route 9 and Unocal Sites

Location	Distance from Unocal Site (miles)	Distance from Route 9 Site (miles)	Parameters Monitored
6120 212th St. SW, Lynnwood	3.3	8.3	$PM_{2.5eq}$, bsp, Wind
44th Ave W & 196th St SW, Lynnwood	4.7	7.3	CO
20935 59th Place W, Lynnwood	3.5	8.1	PM_{10}, PM_{10eq}, $PM_{2.5eq}$, Wind
17711 Ballinger Way NE, Lake Forest Park	5.9	6.8	PM_{10}, $PM_{2.5eq}$, bsp, Wind
Paine Field	9	11	MET
Route 9 Site	12	0	MET
Unocal Site	0.02	12	MET

bsp = atmospheric particles (by nephelometer).
CO = carbon monoxide.
MET = wind speed, wind direction, air temperature, relative humidity, solar radiation, barometric pressure, and rainfall.
$PM_{2.5eq}$ = particulate matter = 2.5 micrometers (equivalent method).
PM_{10} = particulate matter = 10 micrometers (reference method).
PM_{10eq} = particulate matter = 10 micrometers (equivalent method).
Wind = wind direction and speed.

5.2.2.1 Conveyance: Common to All Systems

The regulatory environment, regional climate conditions, and regional air quality for the proposed conveyance systems are the same as for the treatment plant sites discussed above.

5.2.2.2 Outfall: Common to All Systems

The air environment within the vicinity of the outfall sites is characterized by generally good air circulation as the result of the presence of marine winds and the absence of topographic barriers to air movement. The regulatory environment, regional climate conditions, and regional air quality for the alternative outfall sites are the same as for the treatment plant sites discussed above.

5.2.3 Affected Environment: Route 9 System

5.2.3.1 Treatment Plant: Route 9

Topography

The Route 9 site is located just east of SR-9 about 0.5 mile north of the intersection of SR-9 and SR-522, approximately 3 miles northeast of the city of Woodinville. The site lies in a small valley, with hills rising several hundred feet to the east and south.

Site-Specific Meteorological Conditions

The Route 9 monitoring station is located near the center of the site. Analysis of the Route 9 data collected during the 9-month period from July 2002 through March 2003 show that the winds blew predominantly from the north 50 percent of the time and from the south 23 percent of the time. This pattern is consistent during both winter and summer months. The winds at this site generally follow the terrain and flow up and down the SR-9 corridor, mostly following the Little Bear Creek drainage. Nighttime wind patterns are also from the north. The Route 9 onsite meteorological data are discussed in further detail in Appendix 5-A, Odor and Air Quality: Treatment Plant. Effects of these meteorological conditions on air quality emissions are discussed in the Impacts and Mitigation section of this chapter and in Appendix 5-A.

Existing Sources of Odor

PS Clean Air maintains a record of odor complaints by zip code. The Route 9 site is located in zip code 98072. From January 1, 1999, to June 18, 2002, PS Clean Air recorded 51 odor complaints. Twenty-one of the 51 odor complaints were lodged against Eagle Crest Cabinetry, Inc., located at 8330 212th Street SE approximately 0.5 mile north of the Route 9 site. Seventeen of the 51 recorded complaints were against StockPot, Inc., located at 22505 SR-9, adjacent to the Route 9 site. Seven of the 17 complaints against StockPot were made by one individual. The remaining 10 complaints were made by seven other individuals.

Location of Sensitive Receptors

King County is required to determine sensitive receptors in order to show compliance with federal, state, and local air pollution regulations. Sensitive receptors are identified to acknowledge the presence of people within a 5-mile radius of the treatment plant site who may have compromised respiratory systems. People with compromised respiratory systems may be more sensitive to air pollutants. Modeling of potential impacts included the identification of sensitive receptors such as schools, hospitals, and other medical facilities. A total of 46 receptors were identified within a 5-mile radius of the Route 9 site; they are included in Appendix 5-A, Odor and Air Quality: Treatment Plant.

Contamination

The Route 9 site may have areas of soil and/or groundwater contamination, although no such contamination has been identified through onsite studies and no formal cleanup has been mandated by Ecology. Based on past and present uses of the site, contamination at some level is expected. One parcel has been listed on Ecology's Confirmed and Suspected Contaminated Sites List; indicating that investigation under the Model Toxics Control Act (MTCA) may be required. The contamination could likely occur in both soil and groundwater because of the relatively high water table at the Route 9 site. If such contamination is found to be present, cleanup of the contaminated soil and/or groundwater could result in air emissions from the volatilization of contaminants ("volatilization" refers to a change in a chemical's form from a liquid to a vapor, which facilitates its emission into the surrounding air). Potential air emissions are discussed in the Impacts and Mitigation section of this chapter. Further information on potential contamination is included in Chapter 4.

5.2.3.2 Conveyance: Route 9

Topography

The topographic features of the Route 9 conveyance corridors that influence air dispersion consist of moderately hilly terrain with ridgelines generally running from north to south. Between 100th Avenue W and I-405, the area is generally a plateau with undulating ridges and valleys. Near north Lake Washington and Puget Sound, the terrain changes to a gentler slope; near Point Wells, the terrain is flat west of a steep bluff. Two streams, Swamp Creek and North Creek, carve valleys toward the eastern part of this area.

Table 5-2 lists the approximate locations, proposed hydraulic structures, and general local topography of the primary portal siting areas for the Route 9 corridors. Secondary portals are listed in Tables 3-4 and 3-8 of Chapter 3.

Table 5-2. General Topography and Proposed Hydraulic Structures in Primary Portal Siting Areas on the Route 9 Conveyance Corridors

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Topography
195th Street Corridor			
11	Drop structure and diversion structure	Near Existing Kenmore Pump Station NE 175th Street and 68th Ave NE City of Kenmore	Low lying area adjacent to Lake Washington
41	Drop structure and diversion structure *Influent pump station (option)*	Near intersection of NE 195th Street and 120th Avenue NE City of Bothell	North Creek valley
44	Drop structure	Near intersection of NE 195th Street and 80th Avenue NE City of Kenmore	Swamp Creek valley
5	Transition structure	NE 205th Street and Ballinger Way NE City of Shoreline	Hillside
19	Pressure transition structure	NW 205th Street and Richmond Beach Drive NW Unincorporated Snohomish County	Coastal area
228th Street Corridor			
11	Same as 195th Street corridor		
41	Same as 195th Street corridor		
44	Same as 195th Street corridor		
39	Pressure manhole	228th St SE and 31st Ave. City of Bothell	Hillside
33	Pressure manhole	228th St SW and Locust Way City of Brier and Unincorporated Snohomish County	Valley
26	Transition structure	228th Street SW and Lakeview Dr. City of Mountlake Terrace	Valley
19	Same as 195th Street corridor		

Air inversions tend to occur more frequently in late autumn and winter seasons in Western Washington. (As described in the section above titled Regional Climate Conditions, inversions prevent dispersion of air pollutants and odors by trapping them near ground level for up to several days at a time.) The peak wastewater odor season tends to occur during the summer months of July, August, and September when air inversions are less likely to occur and when lower flows are experienced in the conveyance system. Confined low-lying areas and valleys would experience less dispersion than higher areas or plateaus, which take advantage of regional north-south winds.

Existing Sources of Odor

PS Clean Air maintains a record of odor complaints by zip code. Data from PS Clean Air for the areas around proposed portal locations were reviewed for odor complaints and their sources. From June 11, 2001, to June 11, 2003, PS Clean Air recorded six odor complaints in the vicinity of the Route 9 primary portal siting areas. Odor complaints within 1 mile and the identified source of the odor are summarized in Table 5-3.

Table 5-3. Existing Odor Complaints in the Vicinity of the Primary Portal Siting Areas on the Route 9 Corridors

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Number of Odor Complaints (2001-2003)	Odor Source
195th Street Corridor				
11	Drop structure and diversion structure	Near Existing Kenmore Pump Station NE 175th Street and 68th Avenue NE City of Kenmore	2	Sunset Fiberglass, Inc.
41	Drop structure and diversion structure *Influent pump station (option)*	Near intersection of NE 195th Street and 120th Avenue NE City of Bothell	None	-
44	Drop structure	Near intersection of NE 195th Street and 80th Avenue NE City of Kenmore	1	QFC - Bothell
5	Transition structure	NE 205th Street and Ballinger Way NE City of Shoreline	2	Sound Oil Company North Ridge Village
19	Pressure transition structure	NW 205th Street and Richmond Beach Drive NW Unincorporated Snohomish County	1	ChevronTexaco, Inc.

Table 5-3. Existing Odor Complaints in the Vicinity of the Primary Portal Siting Areas on the Route 9 Corridors (cont.)

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Number of Odor Complaints (2001-2003)	Odor Source
228th Street Corridor				
11	Same as 195th Street corridor			
41	Same as 195th Street corridor			
44	Same as 195th Street corridor			
39	Pressure manhole	228th Street SE and 31st Avenue City of Bothell	None	N/A
33	Pressure manhole	228th Street SW and Locust Way City of Brier and Unincorporated Snohomish County	None	N/A
26	Transition structure	228th Street SW and Lakeview Drive City of Mountlake Terrace	None	N/A
19	Same as 195th Street corridor			

Location of Sensitive Receptors

Land use and zoning information was used to characterize the typical receptors that might be located in areas adjacent to portals or conveyance structures along the Route 9 corridors. Because the potential for odors at portals and conveyance hydraulic structures is limited, sensitive receptors such as schools, hospitals, and medical facilities were identified within 1 mile radius of each portal location. These receptors are listed in Appendix 5-B, Odor Analysis: Conveyance. The land use zones in which receptors may typically be found are residential, commercial, and industrial. Because all candidate portal sites are in the immediate vicinity of the center point of each portal siting area, all discussion applies equally to each candidate portal site within a particular portal siting area.

Table 5-4 gives the planned hydraulic structures for the primary portal siting areas for the Route 9 corridors, approximate locations of the portal siting areas, their land use zones, and the number of sensitive receptors within 1 mile.

Table 5-4. Potential Sensitive Receptors in the Vicinity of Primary Portal Siting Areas on the Route 9 Corridors

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Zoning	Number of Sensitive Receptors[a]
195th Street Corridor				
11	Drop structure and diversion structure	Near Existing Kenmore Pump Station NE 175th Street and 68th Avenue NE City of Kenmore	Commercial / Industrial	1
41	Drop structure and diversion structure *Influent pump station (option)*	Near intersection of NE 195th Street and 120th Avenue NE City of Bothell	Industrial / Residential	5
44	Drop structure	Near intersection of NE 195th Street and 80th Avenue NE City of Kenmore	Residential	3
5	Transition structure	NE 205th Street and Ballinger Way NE City of Shoreline	Commercial	5
19	Pressure transition structure	NW 205th Street and Richmond Beach Drive NW Unincorporated Snohomish County	Industrial	2
228th Street Corridor				
11	Same as 195th Street corridor			
41	Same as 195th Street corridor			
44	Same as 195th Street corridor			
39	Pressure manhole	228th Street SE and 31st Avenue City of Bothell	Residential	1
33	Pressure manhole	228th Street SW and Locust Way City of Brier and Unincorporated Snohomish County	Residential	5
26	Transition structure	228th Street SW and Lakeview Drive City of Mountlake Terrace	Residential/ Commercial	10
19	Same as 195th Street corridor			

[a]Source: Jurisdictional land use maps

5.2.3.3 Outfall: Route 9

The preferred outfall alignment for the Route 9 system starts at Portal 19 at Point Wells and extends west into Puget Sound. Odor sources and sensitive receptors are the same as for Portal 19. There is also a potential for soil and/or groundwater contamination at the on-land portion of the outfall, which could result in releases of contamination during construction.

5.2.4 Affected Environment: Unocal System

5.2.4.1 Treatment Plant: Unocal

Topography

The Unocal site is located on the shore of Puget Sound at Edwards Point, adjacent to the Port of Edmonds. A 160-foot-high bluff above Edwards Point occupies the center of the site. The northern portion of the site is flat; the southern portion contains the steeply rising bluff, which levels off near the southern property line. Edmonds Marsh is located to the northeast.

Site-Specific Meteorological Conditions

The Brightwater meteorological station for the Unocal site is located on Port of Edmonds property just north of the former Unocal facility. The ground immediately around the tower is sandy soil, with sparse grass coverage adjacent to railroad tracks to the east and an asphalt parking lot about 25 feet to the west. A boat repair yard is situated to the north and Puget Sound lies generally to the west of the site, with the closest point about 125 feet from the southwest corner of the site.

Analysis of the Unocal monitoring data taken for this project shows that from July 2002 through March 2003, the winds blew predominantly from the north 28 percent of the time and from the south and southeast 38 percent of the time. These north-prevailing winds are a result of air flowing from Puget Sound toward the site, which is typical for land locations close to water. The south and southeast dominating flow is caused by the elevated terrain to the south of the site and the curve of the shoreline that forms Edwards Point. This terrain acts to steer wind flow over and around the land, pushing it down-slope toward the site. This pattern is particularly present during nighttime hours and measurable rain events. The Unocal onsite meteorological data are discussed in further detail in Appendix 5-A, Odor and Air Quality: Treatment Plant. Effects of these meteorological conditions on air quality emissions are discussed in the Impacts and Mitigation section of this chapter.

Existing Sources of Odor

PS Clean Air maintains a record of odor complaints by zip code. The Unocal site is located in zip code 98020. From January 1, 1999, to June 18, 2002, PS Clean Air recorded 16 odor complaints against five different businesses. Seven of the 16 odor complaints were lodged against a single company, AAA Refinishing Services, located at 117 6th Avenue S, approximately 0.75 mile from the Unocal site. Five of the seven complaints against this source were made by one individual. The other nine complaints were fairly evenly distributed among the other four businesses.

Location of Sensitive Receptors

A total of 52 sensitive receptors were identified within 5 miles of the Unocal site. These locations are listed in Appendix 5-A, Odor and Air Quality: Treatment Plant.

Contamination

A portion of the Unocal site is currently undergoing cleanup of contaminated soil and groundwater, as required by Ecology. This type of cleanup may be a source of toxic air pollutant emissions from the volatilization of chemicals in the soil or groundwater. Cleanup of the site is ongoing. Appendix 6-B of this Final EIS presents further information on the types of contaminants present at the Unocal site. Additional discussion regarding the potential impacts to the environment from the cleanup is presented in the Impacts and Mitigation section of this chapter.

5.2.4.2 Conveyance: Unocal

Topography

The topographic features that affect air dispersion along the Unocal corridor consist of plateaus, low-lying areas, and undulating and gently sloping terrain. The influent pipeline would begin in the area of the existing North Creek Pump Station. The topographic features consist of a plateau with undulating ridges and valleys from the North Creek area to the vicinity of the existing Kenmore Pump Station. The Kenmore Pump Station is located in a low-lying area adjacent to Lake Washington. From the Kenmore Pump Station, the alignment heads in a northwesterly direction along Bothell Way NE and up Ballinger Way NE where it crests a ridge. From there, the alignment continues along undulating slopes westward along NE 205th Street, Edmonds Way, and Pine Street, where the terrain changes to a gentler slope to the treatment plant site. Table 5-5 lists the approximate locations of, the planned hydraulic structures for, and the general topography of the primary portal siting areas for the Unocal corridor. Locations of secondary portals are listed in Table 3-12 of Chapter 3.

Table 5-5. General Topography and Proposed Hydraulic Structures in Primary Portal Siting Areas on the Unocal Corridor

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Topography
14	Drop structure and diversion structure	Near North Creek Pump Station, North Creek Pkwy City of Bothell	North Creek valley
11	Drop structure and diversion structure pump station	Near Existing Kenmore Pump Station NE 175th Street and 68th Avenue NE City of Kenmore	Low-lying area
7	Force main discharge structure	Near intersection of Ballinger Way and 25th Avenue NE City of Shoreline	Hillside
3	Manhole	SR-104 and 232nd Street SW City of Edmonds	Hillside

As previously stated, air inversions tend to occur more frequently in late fall and winter in Western Washington. The peak wastewater odor season tends to occur during the month of July, August and September when the air is warm and inversions are less likely to occur and when lower flows are experienced in the conveyance system. Confined low-lying areas and valleys would experience less dispersion than higher areas or plateaus, which take advantage of regional north-south winds.

Existing Sources of Odor

PS Clean Air was contacted to see if there have been any odor complaints and the sources of the odors that prompted the complaints in the areas around primary portal siting areas on the Unocal Corridor. In the time period from June 11, 2001, to June 4, 2003, PS Clean Air Agency recorded four odor complaints in the vicinity of the Unocal primary portals. The odor complaints within 1 mile and the source identified for the odor complaints are summarized in Table 5-6.

Location of Sensitive Receptors

As described for the Route 9 Systems, receptors for conveyance facilities were characterized in terms of predominant nearby land uses and zoning. Because all candidate portal sites are in the immediate vicinity of the center point of each portal siting area, all discussion applies equally to each candidate portal site within a portal siting area.

Table 5-6. Existing Odor Complaints in the Vicinity of the Primary Portal Siting Areas on the Unocal Corridor

Primary Portal Siting Area	Hydraulic Structure	Location	Number of Complaints	Odor Source
14	Drop Structure and diversion structure	Near North Creek Pump Station, North Creek Pkwy City of Bothell	None	-
11	Drop structure and diversion structure pump station	Near Existing Kenmore Pump Station NE 175th Street and 68th Avenue NE City of Kenmore	2	Sunset Fiberglass, Inc.
7	Force main discharge structure	Near intersection of Ballinger Way and 25th Avenue NE City of Shoreline	2	Sound Oil Company North Ridge Village
3	Manhole	SR-104 and 232nd Street SW City of Edmonds	None	-

Table 5-7 gives the planned hydraulic structures for the primary portal siting areas for the Unocal corridor, approximate locations of the portal siting areas, their land use zones, and the number of sensitive receptors within 1 mile.

Table 5-7. Potential Sensitive Receptors in the Vicinity of Primary Portal Siting Areas on the Unocal Corridor

Primary Portal Siting Area	Hydraulic Structure	Location	Zoning	Number of Sensitive Receptors[a]
14	Drop Structure and diversion structure	North Creek Pump Station City of Bothell	Commercial	4
11	Drop structure and diversion structure pump station	Near Existing Kenmore Pump Station City of Kenmore	Industrial/ Commercial	1
7	Force main discharge structure	Near intersection of Ballinger Way and 25th Avenue NE City of Shoreline	Commercial	6
3	Manhole	SR-104 and 232nd Street SW City of Edmonds	Residential	5

[a] Source: Jurisdictional land use maps.

5.2.4.3 Outfall: Unocal

The preferred outfall alignment for the Unocal system starts at the effluent pump station on the Unocal site and extends west into Puget Sound. Existing sources of odors and sensitive receptors are the same as for the Unocal Treatment Plant. Similar to the Route 9 Systems, there is a potential for contamination to be present at the on-land portion of the outfall, which could result in air emissions from volatilization.

5.3 Impacts and Mitigation

5.3.1 Impacts and Mitigation Common to All Systems

This section describes the impacts on the air environment that may result from the construction and operation of any of the Brightwater System alternatives. Impacts were assessed by different methods, depending on the project component:

- The treatment plant would be regulated as a "point source" of air quality emissions and would be required to obtain an NOC permit. The treatment plant would also have the highest potential of all system components, if not mitigated, to generate odors. Therefore, the assessment of impacts for the treatment plant is quantitative. Emission rates and quantities for various pollutants (including odor, criteria pollutants, HAPs, and TAPs) were calculated based on data from other King County wastewater facilities and from wastewater treatment plants throughout the United States. These odor and TAP emission estimates were then used as inputs into an air dispersion model, which uses site-specific meteorological conditions to calculate the concentration of pollutants at specific offsite locations known as "receptors." The grid spacing for receptor points is determined by guidelines for setting up models according to the EPA document *Guidelines on Air Quality Modeling* (GAQM, 40 CFR 51, Appendix W).
- The potential for air emissions from the conveyance pipeline and outfall would be much smaller than from the treatment plant. However, some air impacts would be possible, particularly odor impacts associated with influent conveyance if not mitigated. To address these potential impacts, a qualitative analysis was performed for the conveyance system and outfall. The analysis focused on the types of land uses in the vicinity of each potential odor source and the technology that would be used to control odor at each of these locations.
- Impacts during project construction would primarily be caused by particulate matter generated by earthmoving activities. The particulate matter could also contain hazardous compounds from contamination present in soils on the site. Such impacts can be limited by construction management practices. These impacts are addressed qualitatively for treatment, conveyance, and outfall facilities.

Additional detail on the methodology used for analyzing potential air impacts is included in Appendices 5-A, Odor and Air Quality: Treatment Plant; 5-B, Odor Analysis: Conveyance; and 5-C, Construction-Related Air Impacts: Conveyance.

5.3.1.1 Treatment Plant Impacts Common to All Systems

Construction Impacts Common to All Systems: Treatment Plant

Demolition and construction-related activities would result in short-term impacts to ambient air quality. Dust emissions from heavy construction operations could temporarily elevate levels of particulate matter in the ambient air. These impacts typically are related to fugitive dust emissions in and around the site. The potential for impacts would be short-term, occurring only while demolition or construction work is in progress. No significant long-term adverse impacts on local or regional air quality are anticipated.

Fugitive dust emissions typically occur during building demolition, ground clearing, excavation, site preparation, grading, stockpiling of materials, onsite movement of equipment, and transportation of material. Fugitive dust emissions are greatest during dry periods, periods of intense construction activity, and periods of high-wind conditions. Dust emissions from construction activities should be very low from autumn through spring, when the soil at the site is typically wet and the potential for dust is lower. During dry periods, water trucks would regularly water the construction areas for dust control.

Construction odors (such as odors from painting a building or laying asphalt) might temporarily be noticeable in the project area. Any such odors likely would be intermittent and would be dispersed at increasing distances from the source. The specific potential for dust emissions at the Route 9 and Unocal treatment plant sites is discussed later in this chapter. Fugitive dust emissions from the Route 9 site are expected to be lower than emissions from the Unocal site because the estimated volume of soil to be excavated at the Route 9 site is less.

Both the Route 9 site and the Unocal site have the potential for release of hazardous or toxic substances into the air during construction excavation, because of the potential presence of pre-existing contamination in the soil and groundwater at those sites. The potential for such releases is described in the site-specific impact evaluations below.

Emissions from construction vehicles have the potential to degrade air quality in the surrounding areas. In addition, air emissions could increase because traffic could be halted by construction. Traffic disruptions would be greatest at intersections, leading to increased queuing and concentrated vehicle emissions.

Operation Impacts Common to All Systems: Treatment Plant

Because similar treatment processes and energy production methods would be used at both treatment plant sites, emission estimates for odorous compounds, criteria pollutants, HAPs, and TAPs are very similar for both sites. To assess the impacts of the emissions on each site, dispersion modeling of the emissions was performed. Dispersion modeling uses various site-specific characteristics (for example, topography and meteorology); therefore, the model inputs and results are different for each site.

This section describes the odor and air quality criteria that King County will use in operating the Brightwater facility. These criteria establish the technologies that will be used to minimize air emissions for both sites. Also described in this section are the estimated emission sources and concentrations for odor, criteria pollutants, HAPs, and TAPs. Because dispersion modeling is site-specific, it is discussed in the evaluation of impacts and mitigation for each individual site.

Odor and Air Quality Operational Criteria

Wastewater treatment plants may generate odors when odorous compounds in the wastewater are released into the atmosphere. This can occur at various locations in the collection portion of the conveyance system and treatment plant, especially where there is turbulence (drops, flumes, mixing boxes, screens, and so forth). Odors at wastewater treatment systems are typically from hydrogen sulfide, ammonia, amines, fatty acids and mercaptan-based compounds. These odor-producing compounds are typically generated from anaerobic decomposition of organic matter containing sulfur and nitrogen or may be present from various discharges into the collection system.

King County is committed to operating the Brightwater Treatment Plant with no detectable odors at the property line 365 days per year, 24 hours per day. To this end, stringent design and performance criteria have been established for odor prevention at the facility. These criteria require that odor levels at the property line be less than the initial detection threshold (or first detection of an odor), including during times of peak odor generation within the plant and worst-case meteorological conditions. This objective would be achieved at both treatment plant sites, as described in the site-specific analyses below. More information about odor detection thresholds and the design and performance criteria of the odor prevention system are presented in Technical Appendix 5-A of this final EIS.

In Washington State, all new sources must go through New Source Review (NSR) with the permitting authority, in this case PS Clean Air, unless specifically exempt according to Puget Sound Clean Air Regulation I, Section 6.03. The NSR process requires the source to submit a "Notice of Construction and Application for Approval," commonly referred to as a Notice of Construction (NOC) application, and receive an Order of Approval. The application and approval process is referred to as the NOC permit process. As part of the NOC application, new emission sources must apply BACT, as defined by PS Clean Air, to minimize emissions and comply with all state and local emission standards. Emission sources must also demonstrate that toxic emission will not to have an adverse impact on human health and the environment.

Key elements of the Brightwater odor prevention and air quality program are as follows:

- King County is committed and accountable to PS Clean Air, the State of Washington, and Brightwater's neighbors to meet the objective of no detectable odor at the property line.
- Brightwater's objective for odor prevention is the most stringent in the United States.
- The proposed odor prevention system and air quality emission controls would use best available control technology.

Specific features of the Brightwater odor prevention systems are described under Odor Emissions below, and in greater detail in Appendices 5-A through 5-C.

Odor Emissions

Odor prevention and control have been incorporated into the liquids and solids treatment processes of the treatment plant. The objective of the odor prevention system is to prevent odors from forming and if formed then to control the emissions by capturing and treating the process air to remove the odorous compounds before discharging the air to the atmosphere. Odors are generated at a number of points in the treatment process, particularly during the initial stages of the liquid process (influent pump station, collection system, headworks, and primary clarifiers) and during solids handling. The odor control system will be designed to meet the criteria described above under the Odor and Air Quality Operational Criteria section. For this analysis, the odor control system that was modeled at each site includes the following facilities:

- Influent pump station
- Headworks (screening and grit removal)
- Primary sedimentation basins
- Ballasted sedimentation basins
- Aeration basins
- Membrane tanks
- Solids handling building
- Disinfection for Puget Sound discharge (Unocal only; Route 9 disinfection would occur in the effluent tunnel)
- Disinfection for reuse

Although a number of compounds contribute to wastewater treatment facility odors, two key odor-producing compounds—hydrogen sulfide and ammonia—were modeled for the Final EIS. Odor, which is a combination of all odorous compounds, was also modeled. Both sites were modeled using the following assumptions, which reflect King County's odor control technology commitments, including no detectable odor at the property line:

- Three-stage chemical scrubbing, followed by activated carbon scrubbing, would be used.
- All treatment processes would be covered or enclosed and ventilated under negative pressure to capture and treat process air.
- Liquid-phase treatment would be provided in the collection system and at the influent pump station to reduce the formation of odors, and further reducing downstream treatment plant odor loading.
- Odor prevention systems would be sized to handle worst-case operating conditions, when combinations of meteorological conditions (such as inversions and stagnant air, which tend to occur in the autumn and winter) coincide with peak odor releases from treatment processes (which tend to occur in the summer). In reality, the two events are not expected to occur at the same time.
- Redundant odor control scrubbing equipment would be included in the facility design.
- Additional permanent air scrubbers would be provided and used during maintenance activities that require opening the covered process equipment or buildings. Use of these air scrubbers would ensure that no foul air would be released into the atmosphere during tank cleaning, inspection, and maintenance.

The emission of odors from the treatment plant is a function of the composition and temperature of the influent wastewater and the efficiency of odor prevention and control equipment, primarily the ventilation rates for drawing air through the chemical scrubbers. Based on the conservative predictions for odor-causing compounds in the influent and the design criteria for ventilation, maximum air emissions for hydrogen sulfide were estimated for a 54-mgd capacity treatment plant at the Route 9 and Unocal sites. These estimated emissions are shown in Table 5-8, with a comparison to the emissions that would occur without odor prevention. As shown in the last column of the table, the efficiency of the proposed odor prevention systems in removing odorous compounds is over 99.9 percent at peak load. The mass of total odor was not included in the table because odor is a combination of all the odorous compounds, each with a different mass. The results of the odor dispersion modeling are described in the site-specific impacts section for each site.

Tables 5-11 and 5-15 show that the peak, worst case, 1-hour offsite odor concentrations, (adjusted to reflect 3-minute "puff" conditions) are well below the initial detection thresholds and would achieve the standard of no detectable odor at the site property line. During peak 1-hour events, the stack exhaust concentrations may not be below the initial detection thresholds. However, stack concentrations during worst case, peak, 1-hour event, are sufficiently close enough to the initial detection thresholds to achieve the standard of no detectable odor at the site property line, even under peak conditions. One would have to place their nose directly into the stack exhaust to register any faint odors and the faint odors would dissipate quickly in very short distances from the stack exhaust point.

Table 5-8. Maximum Estimated Odor Emissions With and Without Odor Prevention for a 54-mgd Treatment Plant at the Route 9 and Unocal Sites

Compound	Without Odor Prevention (lb/year)	With Odor Prevention (lb/year)	Removal Efficiency (%)
Hydrogen sulfide	78,600	8.5	99.99
Ammonia	54,700	39.7	99.93

Note: Odor not included in Table 5-8 because the odor is a combination of numerous odorous compounds, each with a different mass, and total mass cannot be quantified. The removal efficiency of total odor would be 99.84%.

Criteria Pollutant and Toxic Air Pollutant Emissions

Quantity of mass emissions of air toxics from the treatment plant's liquid processes were predicted using the Bay Area Sewage Toxics Emission (BASTE) model (*BASTE User's Manual, Version 3.0.* 1992. Bay Area Air Toxics Group). BASTE is a fate model specifically designed for use by publicly owned treatment works (POTWs) to estimate emissions from liquid wastewater treatment processes that result from volatilization, sorption, and biodegradation. BASTE is POTW-specific, has been validated on numerous POTW applications since it was developed in 1989, and is one of four models (others are ToxChem, Water9, and Water7) currently accepted by EPA for estimating air emissions from POTWs. Additional information about the BASTE model and why it was chosen for estimating the mass emissions is presented in Technical Appendix 5-A.

Emissions from the solids treatment processes result from two processes: gravity belt thickeners (GBTs) and dewatering centrifuges. The emissions from dewatering centrifuges were estimated using the Pooled Emission Estimation Program (PEEP). PEEP was established to develop an industry-wide method for estimating air toxic emissions from 18 POTW unit processes. The annual average emission rates at other POTWs were adjusted using the wastewater flow rates for Brightwater. The emissions from the GBTs at Brightwater were estimated using the appropriate sludge flow rates for Brightwater and actual annual emissions from GBTs at other POTWs.

Digestion occurs in pressurized vessels that are not exposed to the atmosphere. Under emergency conditions the digesters may release digester gas through pressure relief valves to relieve the pressure on the vessels. The digesters would have a carbon system to scrub the digester gas in the event of an emergency release. The emissions from the emergency pressure relief valve carbon system were not modeled as they do not occur on a regular basis and emissions are variable.

Emission factors provided by EPA were used to estimate criteria pollutant, HAP, and TAP emissions from combustion sources. Four types of combustion sources were considered:

- Co-generation turbine generators (co-generators) operating on digester gas and natural gas
- Standby reciprocating internal combustion engine generators operating on diesel fuel, used as an emergency source of power for up to 500 hours per year
- An enclosed flare for combustion of digester gas when the co-generators are down
- Hot water boilers operating on natural gas for heating during the winter

Assumptions were made regarding the types, configuration, and capacity of the combustion units. Final selection, configuration, and capacity will be determined during project design. Additional detail on the assumptions used in estimating emissions of TAPs and HAPs can be found in Appendix 5-A, Odor and Air Quality: Treatment Plant.

Table 5-9 shows a summary of estimated total HAP and TAP emissions for a 54-mgd treatment plant at the Route 9 and Unocal sites, as well as for a 72-mgd plant at the Unocal site. These emissions are from all liquid process, solids process, and combustion sources at the treatment plant. Table 5-10 shows a summary of estimated potential HAP and TAP emissions at the treatment plant sites.

Table 5-9. Estimated Potential Hazardous and Toxic Air Pollutant (HAP and TAP) Emissions From a 54-mgd Treatment Plant at the Route 9 and Unocal Sites and a 72-mgd Plant at Unocal

Pollutant	TAP = T HAP = H	54 mgd (Route 9 and Unocal) (lb/yr)	72 mgd (Unocal only) (lb/yr)
2-Methylnaphthalene	T, H	0.0034	0.0046
Acetaldehyde	T, H	56	69
Acrolein	T, H	8.7	10.8
Acrylonitrile	T, H	4.8	6.3
Ammonia	T	39.7	52.5
Arsenic	T, H	0.029	0.038
Barium	T	0.63	0.84
Benzene	T, H	119	147
Butane	T	299	399
Cadmium	T, H	0.16	0.21
Carbon tetrachloride	T, H	16	22
Chlorobenzene	T, H	92	114
Chloroform	T, H	961	1283
Chromium	T, H	0.200	0.266

Table 5-9. Estimated Potential Hazardous and Toxic Air Pollutant (HAP and TAP) Emissions From a 54-mgd Treatment Plant at the Route 9 and Unocal Sites and a 72-mgd Plant at Unocal (cont.)

Pollutant	TAP = T HAP = H	54 mgd (Route 9 and Unocal) (lb/yr)	72 mgd (Unocal only) (lb/yr)
Dichlorobenzene	T, H	158	195
Dichloroethane	T, H	0.034	0.045
Ethylbenzene	T	126	156
Fluoranthene	T, H	0.0004	0.0006
Fluorene	T, H	0.0004	0.0005
Formaldehyde	T, H	916	1122
Hexane	T, H	257	342
Hydrogen Sulfide	T	8.5	11.1
Lead	T, H	0.071	0.095
Manganese	T, H	0.054	0.072
Mercury	T, H	0.037	0.049
Methylene chloride	T, H	205	273
Methyl chloroform (1,1,1 Trichloroethane)	T, H	693	925
Molybdenum	T	0.157	0.209
Naphthalene	T, H	2.1	2.5
Nitric oxide	T	67,789	84,127
PAHs	T, H	3.0	3.7
Pentane	T	371	494
Phenanthrene	T, H	0.0024	0.0032
Pyrene	T, H	0.0007	0.0010
Selenium	T, H	1.4	1.8
Styrene	T, H	29	36
Tetrachloroethylene (perchloroethylene)	T, H	1401	1871
Toluene	T, H	669	827
Trichloroethane	T, H	0.0007	0.0010
Trichloroethylene	T, H	135	179
Vanadium	T	0.33	0.44
Vinyl chloride	T, H	3.3	4.4
Vinylidene chloride	T, H	41	55
Xylene	T, H	697	862
Zinc	T	4.1	5.5
Total HAPs		**5,700**	**7,500**
Total TAPs		**75,100**	**93,600**

Table 5-10. Estimated Potential Criteria Pollutant Emissions From a 54-mgd Treatment Plant at the Route 9 and Unocal Sites and a 72-mgd Plant at Unocal

Pollutant	54 mgd (Route 9) (tons/yr)	54 mgd (Unocal) (tons/yr)	72 mgd (Unocal) (tons/yr)
Nitrogen oxides	36	36	44
Carbon monoxide	48	48	60
Particulate matter < 10 microns	5	5	7
Particulate matter < 2.5 microns	5	5	7
Sulfur dioxide	6	6	8
Volatile organic compounds	5	5	6

The estimated potential emissions from the treatment plant were compared to the permit applicability guidelines discussed in the Affected Environment Common to All Systems section of this chapter. According to these guidelines, potential emission levels determine the types of permits a facility needs to acquire. The potential criteria pollutant emission for a 54-mgd treatment plant at either site is less than 100 tons per year for each of the criteria pollutants. Therefore, the treatment plant is not considered a major source of criteria pollutants. In addition, either treatment plant site alternative would emit less than 25 tons per year of total HAPs and, therefore, would not be a major source of HAPs. Because all of the emissions from the treatment plant sites are well under the major source thresholds, the treatment plant as currently proposed would be required to obtain an NOC permit, but not a Title V operating permit.

Dispersion modeling was also conducted for TAPs at the treatment plant sites to determine whether any TAPs were predicted to exceed ASILs beyond the property line. The results of this modeling are described in the site-specific impact and mitigation discussions below.

Proposed Mitigation Common to All Systems: Treatment Plant

Treatment Plant Construction Mitigation

Implementation of the following activities would result in reduced particulate, vehicle, and equipment emissions:

- The running time of diesel engines on the construction site would be limited to the greatest extent possible. For example, limiting the idling time of dump trucks significantly reduces total vehicle emissions.

- Where possible, construction road surfaces would be paved or treated with a dust suppressant.
- Stockpiled soils would be covered or kept wet to reduce the potential for fugitive dust emissions.
- Tires and undercarriages of vehicles would be cleaned before the vehicles enter public streets to limit the spread of dust offsite.
- Vacuum-type street sweepers would be used as necessary on paved roads adjacent to construction sites.

Treatment Plant Operation Mitigation

As discussed in the Odor Emissions section, odor control would be incorporated into the treatment plant design. The objective of the odor control system would be to capture and treat process air to remove the odorous compounds before they are discharged to the atmosphere.

Hydrogen sulfide is the main odorous compound produced in wastewater treatment, but other odorous compounds such as reduced sulfur compounds, ammonia, fatty acids, and amines would also be removed. The built system would be designed for 99.99 percent removal of hydrogen sulfide at peak load conditions and no detectable odor at the property line 365 days per year 24 hours per day. More information about the design and operation of the odor control system is presented in Appendix 5-A, Odor and Air Quality: Treatment Plant.

An odor reserve fund would be created as part of the mitigation program to ensure that the odor control goals for the Brightwater treatment plant are met. The fund would be used to augment the odor control system, if necessary, to meet the goal of no detectable odors at the property line. Details of the reserve fund, including its size, management structure, and implementation would be determined during the permitting process.

In addition, King County would develop and implement an odor monitoring and response plan prior to startup of the treatment plant. The plan would address the type, location, and frequency of monitoring, and the method and time frame for response to odor complaints. Details of the plan would be developed during the permitting process.

The treatment plant would comply with all applicable air quality regulations. The air permitting process would include an evaluation of best available control technology (BACT). In compliance with TAP regulations, dispersion modeling has been performed to demonstrate that the emissions from the treatment plant would not create any impact above the acceptable source impact levels (ASILs), except for chloroform. Chloroform emissions are regularly above the ASILs at other similar sized wastewater treatment plants due to the chlorine in the drinking water that is discharged to the treatment plant. It is common to do a second tier analysis to determine the health impacts of the emissions above the ASILs, in this case only for chloroform. Typically the second tier health impact assessment shows little to no health risks due to chloroform in the area surrounding a wastewater treatment plant. These regulations and procedures have been put into place to protect human health and the environment. Therefore, air emissions from the treatment plant would be protective of both human health and the environment.

5.3.1.2 Conveyance Impacts Common to All Systems

Construction Impacts Common to All Systems: Conveyance

Primary Portals

In general, air-related impacts resulting from construction of the conveyance system would be similar to but on a smaller geographic scale than those described above for the treatment plant sites. Demolition and construction-related activities at portals could last from 1 to 4 years, resulting in short-term impacts to ambient air quality by temporarily elevating levels of airborne particulate matter. Fugitive dust emissions are greatest during dry periods, periods of intense construction activity, and periods of high-wind conditions. Dust emissions from construction activities should be very low from autumn through spring, when the soil at the site is typically wet and the potential for dust is lower.

Spoils would be removed from the launching portals (as described in Chapter 3) by loading muck cars inside the portal. The muck cars travel along a rail system inside the mined tunnel to the portal opening. When the cars reach the portal opening, they are lifted above the waiting dump trucks. A gate in the bottom of the muck car is opened, and the spoils drop into the dump trucks for conveyance offsite. Most dump-truck loading would take place during daylight hours. Soil excavated during nighttime construction activities would be stockpiled and removed normal construction hours. Therefore, the greatest likelihood of generation of particulate emissions would be during daylight hours. However, the probability of dust emissions offsite as a result of wind blowing across stockpiled spoils would be low because material from the tunneling operation would be relatively wet. In addition to emissions at construction sites, traffic along unpaved surfaces at the construction sites could result in increased dust emissions from trucks removing the spoils.

Decreased roadway capacity from the use of the roads by construction vehicles and emissions generated from construction vehicles have the potential to degrade air quality in the surrounding areas. Traffic disruptions would be greatest at intersections, leading to increased queuing and emissions of combustion pollutants (primarily carbon monoxide). In addition to emissions from dump trucks carrying spoils, some non-street-licensed equipment, such as diesel-powered excavation equipment, would be used during construction and would result in emissions of carbon monoxide and other pollutants at the construction site.

The potential exists during construction activities to encounter subsurface contamination, which could result in air emissions. Petroleum hydrocarbons would be the most likely contaminants encountered. Based on preliminary characterization of contaminants along the conveyance corridors, the total amount of surface earth disturbed during construction in potentially contaminated areas would be much lower than the amount of contaminated soil removed from the Unocal site. Because the amount of disturbance would be limited and only very small amounts of any pollutants present would be released into the air, it is not anticipated that excavation in such areas would result in air emission rates exceeding the small quantity emission rates (SQERs) provided in WAC 173-460-080(e). Emission levels below the SQERs are considered to be non-harmful to human health and the environment. Therefore, no significant air quality-related impacts from these contaminants are anticipated.

Secondary Portals

If secondary portals are used the impacts would be much less and for a much shorter period of time than the primary portals. The use of secondary portals is unlikely. The maximum size of a secondary portal is approximately 8 feet in diameter. Three scenarios that could result in the use of secondary portals: temporary ventilation, deep ground improvement, and supply of backfill grout. A ventilation shaft would involve drilling and casing the shaft down to the tunnel alignment depth. The shaft would provide ventilation during the tunnel construction and after completion of tunnel the ventilation shaft would be sealed.

Connections to the Existing Wastewater System

Several connections would be made to the existing wastewater system to direct flows to the Route 9 or Unocal sites. These connections are described below.

Kenmore Pump Station Connection

The Kenmore-Bothell interceptor conveys flows to the existing Kenmore Pump Station located near Portal Siting Area 11. The Kenmore-Bothell interceptor connects to the existing Kenmore Pump Station's influent structure where the wastewater is pumped. Diversion of flows away from the existing Kenmore Pump Station to the influent tunnel will require jacking a new pipe from the Kenmore Pump Station to Portal Siting Area 11 and construction of a new diversion structure adjacent to the existing pump station. The new diversion structure would be about 500 square feet and about 30 feet deep. The pipe jacking and diversion structure construction impacts would be localized and construction would take a few months. During construction of the new diversion structure over the Kenmore-Bothell Interceptor, some odorous gases maybe released from the pipe to the atmosphere.

Kenmore Local Sewer System Connections

One local connection would be made to the existing sewer system in the Kenmore area. This connection would be located in the vicinity of NE 175th Street and 61st Avenue NE. The flow would be directed to Portal 11. Construction impacts would be localized and construction completed within a few weeks. During construction of the local connection there may be some odorous gases released from the pipe to the atmosphere.

Swamp Creek Trunk Connection

The Swamp Creek trunk currently flows into the Bothell-Woodinville interceptor, which flows to the Kenmore Pump Station. The Swamp Creek trunk alignment is close to Portal Siting Area 44; therefore, Swamp Creek flow from north of NE 195th Street may be directly diverted to Portal 44. Swamp Creek flows south of NE 195th Street would flow into the Bothell-Woodinville interceptor and to the Kenmore Pump Station. The Swamp Creek Trunk Connection would require construction of a new diversion structure on the Swamp Creek Trunk and require open cut excavation in street right of way for several blocks depending on the final route. During construction of the diversion structure over the Swamp Creek Trunk, some odorous gases may be released from the pipe to the atmosphere.

North Creek Pump Station Connection

The existing North Creek Pump Station receives flows from the Bothell-Woodinville interceptor and the North Creek trunk via the existing North Creek diversion structure. Flows can be conveyed to the existing North Creek Pump Station or, during periods of wet weather, to the North Creek storage facility or the Kenmore Pump Station via the Kenmore-Bothell interceptor. This entire system would connect directly to the new influent tunnel via a diversion structure.

Diversion of flows at North Creek could occur by construction of a new diversion structure, or the existing North Creek diversion structure could be modified to accommodate the new conveyance system. North Creek flows would be diverted to Portal 41 for the Route 9 System alternatives. A new 72-inch-diameter pipeline would convey flows from the new diversion structure to a drop structure located within Portal 41, which is directly connected to the influent tunnel for the Brightwater System. The new 72-inch pipe would be micro-tunneled in street right-of-way with minimal impacts to vehicle or pedestrian traffic. During construction of the connection between the existing North Creek diversion structure and the new 72-inch pipe, there may be release of some odorous gases to the atmosphere. For the Unocal Alternative, the flows would be conveyed to Portal 14 located near the existing North Creek Diversion Structure. No drop structure would be required for diversion of flows to Portal 14 which would be the upstream portal for the influent tunnel for the Brightwater System.

Operation Impacts Common to All Systems: Conveyance

Odor Emissions

Wastewater may generate odors when odorous compounds in the wastewater are released into the atmosphere. This can occur at various locations in the conveyance system especially at locations with hydraulic structures that create turbulence. Common odors associated with wastewater are typically from hydrogen sulfide, ammonia, amines, fatty acids and mercaptan-based compounds. These odor-producing compounds are typically generated from anaerobic decomposition of organic matter containing sulfur and nitrogen. The most common odor in the conveyance system is typically hydrogen sulfide and organic type odors.

Odor emissions could occur at pump stations and hydraulic structures that connect the existing wastewater system to the new influent tunnel and at any permanent access and/or ventilation facilities along the conveyance system. The proposed underground structures along the conveyance corridors would be relatively small (less than 1,000 square feet). The size of above-ground odor control structures could range from 1,400 to 4,4000 square feet, depending on which odor control technologies are selected.

Odors would potentially be generated in the entire influent tunnel and possibly in the gravity flow portion of the effluent tunnel. Odors become a problem if they are released untreated into the environment at manholes, access points, or other structures. The release mechanism of odorous air into the environment is a complex function of conveyance system hydraulics and structure configuration. Air either enters or leaves conveyance structures as the flow rate changes in pipes under open-channel gravity-flow conditions. Wastewater pulls air in the direction that the wastewater is flowing in a pipeline. During steady or declining flows, air enters, or “ingasses,” into the pipe. During rising flows, air is purged, or “outgasses,” from the pipe. Structures in the gravity system can block air flows or change air flow patterns, resulting in pressurization of the pipe or structures and the release of odorous gases into the environment.

The following summarizes air release locations in typical conveyance systems. These potential release points are described without consideration of potential mitigation measures.

- **Force Main (Gravity Pressure Pipe) Discharge Points.** Odors may be a problem at force main or pressure pipe discharge points because of long detention times in the force main, which result in anaerobic conditions. The turbulence at the discharge point releases entrained odorous gases not only in the force main/pressure pipe but also in the receiving gravity wastewater flow. The combination of air released from the force main and air displaced at the discharge point can force foul air into the surrounding environment.

- **Gravity Pipe Structures.** Transition, flow diversion, and junction structures at points along a gravity pipeline may be odor problem areas because of turbulence and air displacement associated with changes in flow direction and merging of flows.
- **Drop Structures.** Drop structures are normally highly turbulent structures that may result in the release of odorous gases. Vortex type drop structures are often used to minimize the amount of turbulence associated with the drop structure, but they still can result in releases of entrained odorous gas. In addition, drop structures can entrain a significant volume of air and pressurize downstream pipes.

Criteria and Toxic Air Pollutant Emissions

Operation of the conveyance system is not expected to result in emissions of hazardous and toxic air pollutants that would exceed ambient air quality standards. The volatilization of hazardous and toxic air pollutants present in the wastewater could occur in the conveyance system, but the pollutants would be released to the atmosphere only in locations where the conveyances system would outgas (at the portals with hydraulic structures). The amount of air pollutants in wastewater conveyed in pipes has not been quantified for the Brightwater System, but is expected to be very low considering the low volume of air that would typically outgas from sanitary sewer manholes. Typically, the composition of air pollutants in conveyance systems is constantly varying and difficult to quantify. Odor prevention equipment is designed to address odorous compounds only, not air pollutants. Proposed odor prevention equipment may or may not remove these air pollutants depending on the nature of the pollutant. However, no removal of these pollutants is assumed and the uncontrolled emission levels are expected to be below the ASILs.

No power generation facilities would be required at the proposed hydraulic structures or odor control facilities located in the conveyance system, and, therefore, no criteria pollutants would be generated by combustion sources. PS Clean Air would require a Notice of Construction and Order of Approval permit for the operation of the odor control equipment.

Emergency diesel generators would provide backup power for the influent pump station for the Route 9 alternative whether it is located at the treatment plant site or at Portal 41 and at the pump station at Portal 11 for the Unocal Alternative. The impacts of the diesel generators would be the same as locating them at the treatment plant. The diesel generators would be used only when the main power feeds to the influent pump station fail and when routine maintenance and exercising take place. A Notice of Construction application or an Order of Approval to construct is not required for standby diesel generators, provided that a complete notification is filed with PS Clean Air prior to startup.

Proposed Mitigation Common to All Systems: Conveyance

Conveyance Construction Mitigation

Mitigation for conveyance construction activities would be the same as described above for the treatment plant.

Conveyance Operation Mitigation

King County would install odor control equipment (consisting of chemical scrubbers and/or biofilters, carbon bed filters, chemical injection, or a combination of the above) at all potential odor sources in the conveyance system to minimize emissions of odorous compounds to the atmosphere. The level of odor control and specific type and amount of equipment installed at each facility would depend on the maximum potential amount of odorous air that could be released by the structure.

As with the treatment plant, King County has committed to operational criteria, including the use of odor removal equipment, for odor prevention at the conveyance facilities. The location where these criteria apply is referred to as the odor emission point. For the Brightwater conveyance facilities, the odor emission point would be located at the stack. Measuring at the stack requires a higher level of treatment because dispersion is not used to help achieve the odor threshold level. For smaller sites, where the stack is near a property boundary or nearby receptors, achieving the odor threshold at the stack is desirable because available space for dispersion may be inadequate. Meeting odor criteria at the stack would help ensure that there are no odors at the property line.

All odor control equipment would be designed to ensure a high hydrogen sulfide removal efficiency. This efficiency would be monitored by measuring the exhaust gas hydrogen sulfide concentration. It can be assumed that a high level of removal has been achieved if the exhaust concentration is below the monitoring equipment's detection limit. If the concentration is greater than the monitoring equipment's lower detection limit, then the inlet gas concentration would be measured and the removal percentage calculated. If the removal efficiency is below the design value, the scrubber would be cleaned and/or repaired.

Redundancy is required in order to continue to achieve a high level of removal during maintenance of the odor control equipment. Connections for mobile odor control units would be provided for each proposed odor control facility to provide continuous odor control during equipment downtime.

Odor control would be incorporated into the design of conveyance hydraulic structures. The objective of the odor control system would be to minimize opportunities for odor generation in the conveyance system and to capture and treat process air to remove the odorous compounds before discharging the air to the atmosphere.

5.3.1.3 Outfall Impacts Common to All Systems

Construction Impacts Common to All Systems: Outfall

Air emissions associated with construction of the offshore portions of the Brightwater outfall would include emissions of combustion pollutants (primarily carbon monoxide and particulate matter) from marine vessels performing in-water construction work.

Onshore combustion emissions would also occur from construction activity at on-land connection and staging areas. In general, impacts resulting from construction of the outfall would be similar to but on a smaller geographic scale than those described above for the treatment plant sites. Demolition and construction-related activities would result in short-term impacts to ambient air quality. Dust emissions from heavy construction operations could temporarily elevate levels of particulate matter in the ambient air. These impacts typically are related to fugitive dust emissions in and around the site. The potential for impacts would be short-term, occurring only while demolition or construction work is in progress. No significant long-term adverse impacts on local or regional air quality are anticipated.

Fugitive dust emissions typically occur during building demolition, ground clearing, excavation, site preparation, grading, stockpiling of materials, onsite movement of equipment, and transportation of material. Fugitive dust emissions are greatest during dry periods, periods of intense construction activity, and periods of high-wind conditions. Dust emissions from construction activities are expected to be very low from autumn through spring, when the soil at the site is typically wet and the potential for dust is lower. During dry periods, water trucks would regularly water the construction areas for dust control.

The potential exists during construction activities for either the Route 9 or Unocal outfall to encounter subsurface contamination, which could result in release of hazardous or toxic substances into the air petroleum hydrocarbons would be the most likely contaminants encountered). Dispersion modeling for these contaminants was not conducted for this Final EIS because the amount of contaminated material to be excavated and the period over which the excavation of this material would be completed (both critical factors in dispersion modeling) are not known at this time. This modeling would be conducted during permitting for the site, if required. However, because the type of contamination at the outfall sites is expected to be similar to that the Unocal site and because the volume of soil to be excavated would be much less than the volumes at the Unocal site, it is not anticipated that excavation in such areas would result in air emission rates exceeding the small quantity emission rates (SQERs) provided in WAC 173-460-080(e). Emission levels below the SQERs are considered non-harmful to human health and the environment. Therefore, no significant air quality-related impacts from these contaminants are anticipated.

Emissions from construction vehicles have the potential to degrade air quality in the surrounding areas. In addition, air emissions could increase because traffic could be halted by construction. Traffic disruptions would be greatest at intersections, leading to increased queuing and concentrated vehicle emissions.

Operation Impacts Common to All Systems: Outfall

Operation of the outfall is not expected to include any sources of air emissions and is therefore not expected to result in any impacts to air quality.

Proposed Mitigation Common to All Systems: Outfall

Mitigation for outfall construction activities would be the same as described above for the treatment plant. To reduce air emissions in the outfall zone during construction, marine vessels and equipment would be required to use emission control measures similar to those described for land-based equipment for treatment plant sites. Best management practices, as described in the earlier discussion of treatment plant construction mitigation common to all systems, would be used to minimize dust emissions. These practices include covering or wetting of stockpiled soils, watering the roads, and cleaning the tires and undercarriages of construction vehicles before they enter public streets. Through use of these practices, the potential for particulate matter to migrate offsite would be minimized.

HAPs and TAPs are not expected to be higher than the small quantity emission rates (SQERs) and would be monitored during construction. If the ambient levels are above the SQERs, dispersion modeling would be done to quantify potential impacts and develop a mitigation plan.

5.3.2 Impacts and Mitigation: Route 9 System

5.3.2.1 Treatment Plant: Route 9

Construction Impacts: Route 9 Treatment Plant

As described in the section on treatment plant construction impacts common to all systems, demolition and construction-related activities would cause short-term local increases in levels of particulate matter as a result of fugitive dust emissions. Such emissions would be lower at the Route 9 site, which would require excavation and removal of fewer cubic yards of onsite soil, than at the Unocal site. Cut and fill soil volumes are described in Chapter 4, Earth. Best management practices would be used to minimize dust emissions, as described earlier for mitigation common to all treatment plant systems. They include covering or wetting of stockpiled soils, watering the roads, and cleaning the tires and undercarriages of construction vehicles before they enter public streets. Through use of these measures, the potential for particulate matter migrating offsite would be minimized.

The history of land uses at the Route 9 site (auto wrecking yards) indicates that some contaminants could potentially have leaked from vehicles and other sources into the surface soils at the site. These contaminants could become airborne during construction. However, the expected concentration of these contaminants in the soil and the volumes of material to be excavated from the site are less than at the Unocal site. Therefore, air emission impacts from the cleanup of contaminated soils and fugitive dust should be less for the Route 9 site than for the Unocal site.

Because less excavated material would be removed from the Route 9 site than from the Unocal site, the number of haul truck trips would be fewer, resulting in lower air impacts from the combustion of diesel haul trucks. A detailed discussion of construction traffic, including haul truck trips, is provided in Chapter 16, Transportation. The potential for impacts would occur only while demolition or construction work is in progress. No long-term adverse impacts on local or regional air quality are anticipated.

The potential air quality impacts from the concurrent Brightwater Treatment Plant construction and Route 9 widening are described in the Cumulative Impacts section.

Operation Impacts: Route 9 Treatment Plant

Odor Dispersion Modeling

Estimates of the emissions of hydrogen sulfide, ammonia, and odor from the treatment plant were used in a dispersion model to determine potential odor impacts on the ambient air around the facility. Table 5-11 shows the results of the dispersion modeling for peak emission levels.

The odor dispersion modeling used data from both the onsite meteorological station and data from Paine Field in Everett. Compared to the data from the Route 9 site, the Paine Field data represent a more conservative or worst-case scenario because the atmospheric conditions at Paine Field have more stable periods than the treatment plant site, resulting in poorer dispersion of pollutants. As noted in the Impacts and Mitigation Common to All Systems section, the goal for odor control at the Brightwater Treatment Plant is to prevent odors from occurring at or beyond the property line of the treatment plant.

Based on the odor dispersion modeling, no odors would be detected offsite, even under worst-case conditions. Worst-case operating conditions are defined as when combinations of meteorological conditions (such as inversions and stagnant air, which tend to occur in the autumn and winter) coincide with peak odor releases from treatment processes (which tend to occur in the summer). In reality, the two events are not expected to occur at the same time but were modeled to predict the potential worst-case conditions.

The maximum offsite concentrations (1-hour peak adjusted for 3-minute "puff" conditions) of odor for the Route 9 site operating at 36 mgd are 0.004 dilutions to threshold (D/T) (using onsite data) and 0.006 D/T (using Paine Field data). Comparing these concentrations to a detection threshold of 1 dilution to threshold (D/T) shows that the maximum offsite concentration is approximately 167 times less than the concentration required for an odor to be detected. The maximum offsite concentrations of hydrogen sulfide for the Route 9 site operating at 36 mgd are 0.03 parts per billion by volume (ppbV) (using onsite data) and 0.03 ppbV (using Paine Field data). Comparing these concentrations to a detection threshold of 0.8 ppbV shows that the maximum offsite concentration is approximately 27 times less than the concentration required for hydrogen sulfide to be detected. The maximum offsite concentrations of ammonia for the Route 9 site operating at 36 mgd are 0.53 ppbV (using onsite data) and 0.77 ppbV (using Paine Field data). Comparing these concentrations to a detection threshold of 2,800 ppbV shows that the maximum offsite concentration is approximately 3,600 times less than the concentration required for ammonia to be detected. As a result, no detectable offsite odors are expected to result from operation of the Brightwater Treatment Plant.

Table 5-11. Estimated Peak Offsite Odor Concentrations for a 36-mgd and 54-mgd Treatment Plant at the Route 9 Site

Parameter	Based on Onsite Meteorological Data	Based on Paine Field Meteorological Data	Initial Detection Threshold[a]
36-mgd			
Odor (D/T)	0.004	0.006	1
H_2S (ppbV)	0.03	0.03	0.8[a]
NH_3 (ppbV)	0.53	0.77	2,800 [a]
54-mgd			
Odor (D/T)	0.006	0.007	1
H_2S (ppbV)	0.04	0.05	0.8 [a]
NH_3 (ppbV)	0.79	0.96	2,800 [a]

[a]Thresholds based on recent work done by St. Croix Laboratories for Sacramento Regional Sanitation District (McEwen, personal communication, 2002).
D/T = dilution to threshold.
H_2S = hydrogen sulfide.
NH_3 = ammonia.
ppbV = parts per billion volume.

Air Quality Dispersion Modeling

Operation of the wastewater treatment plant would result in emissions of TAPs. The emission rate for each TAP was compared to a small quantity emission rate (SQER), identified in WAC 173-460-080 (e). The SQER can be used to demonstrate compliance with the applicable acceptable source impact level (ASIL) as an alternative to using dispersion modeling. If the expected emissions are below an SQER, no further air quality impact analysis is required in most cases. If the emissions are above the SQER, ambient air quality modeling is required.

The emission rates of 17 compounds from the Brightwater Treatment Plant either would exceed their respective SQERs or do not have SQERs. These compounds are acetaldehyde, acrolein, arsenic, benzene, cadmium, chloroform, chromium, ethylene dibromide, formaldehyde, methylene chloride, methyl chloroform, nitric oxide, polycyclic aromatic hydrocarbons (PAHs), tetrachloroethylene, trichloroethylene, xylene, and lead. These compounds were, therefore, modeled to determine their potential to exceed the ASILs at or beyond the fenceline of the treatment plant. Because hydrogen sulfide is a TAP, emission rates from the odor modeling described above were also compared to the SQER for hydrogen sulfide. The hydrogen sulfide emission rates were less than the SQER; therefore, hydrogen sulfide would not exceed the ASIL at or beyond the facility's fence line.

The results of the dispersion modeling (provided in full in Appendix 5-A, Odor and Air Quality: Treatment Plant) indicate that no compounds, except for chloroform, would exceed ASILs beyond the property line of the treatment plant at the Route 9 site. An evaluation of the removal efficiency of carbon and its feasibility as a control device for chloroform is currently being conducted. If it is not technically feasible to control chloroform to levels that meet the ASIL using carbon or some other control technology, then a more detailed analysis of potential human health impacts, known as a "second tier" analysis, would be conducted as part of the permitting process. A second tier analysis is an optional procedure that uses a health impact assessment instead of ASIL. Following EPA approved methods, risks could be more accurately characterized by using updated EPA unit risk factors, inhalation reference concentrations, or other EPA-recognized approved methods. A second tier analysis includes a discussion of the demographics pertinent to assessing the public health risk, a brief review of the toxicological literature regarding chloroform, characterization of existing emissions and exposure pathways, and a quantitative estimate of the cancer risk to potentially exposed individuals. Chloroform emissions are regularly seen above the ASILs at other similar sized wastewater treatment plants because of the chlorine in the drinking water that enters the treatment plant.

It is common for a second tier analysis to be done on wastewater systems; typically, the health impact assessment shows little to no health risk from chloroform in the area surrounding a wastewater treatment plant. A second tier analysis was conducted for King County's West Point Treatment Plant in 1982. The analysis concluded that exposure to Fort Lawton residents to the chloroform emissions from the West Point plant yielded an estimated cancer risk that was well below the generally accepted cancer risk of one in one million. Several risk assessments similar to a second tier analysis have been conducted in California under AB2588 Risk Assessment and Air Toxics "Hot Spots" Information and Assessment Act of 1987. Several wastewater treatment plants emitted more chloroform (in pounds/year) than Brightwater is estimated to emit, and they were determined to show little to no health risks to the surrounding communities.

Proposed Mitigation: Route 9 Treatment Plant

Proposed mitigation for the Route 9 site would be as described earlier for treatment plant construction mitigation common to all systems.

5.3.2.2 Conveyance: Route 9

Construction Impacts: Route 9 Conveyance

Primary Portals

Construction impacts for the conveyance system would be as described above under Impacts and Mitigation Common to All Systems. The impacts at specific primary portal locations are summarized in Table 5-12. Details on the impacts at the primary and secondary portals are described in Appendix 5-C, Construction-Related Air Impacts: Conveyance.

Secondary Portals

Construction impacts for the conveyance system would be as described above under Conveyance Impacts Common to All Systems. Secondary portals are not expected to be used; therefore, no impacts are anticipated. However, if they were to be used, the impacts would be much less and for a much shorter period of time than the primary portals.

Table 5-12. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Route 9 Corridors

Candidate Portal Site	Adjacent Land Use	Topography	Potential Areas Affected by Dust Created During Construction
195th Street Corridor			
Portal Siting Area 11			
A	Light industrial and commercial area, commercial area has retail/business north of NE Bothell Way	Low area with gentle slope uphill to the northeast	Nearby businesses
B	Light industrial and commercial area, commercial area has retail/business north of NE Bothell Way	Located in a low area on a gentle slope uphill to the northeast	Nearby businesses
C	Urban commercial areas surrounding the site with residential area to northwest	Gentle slope uphill to the northwest	Nearby buildings

Table 5-12. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Route 9 Corridors (cont.)

Candidate Portal Site	Adjacent Land Use	Topography	Potential Areas Affected by Dust Created During Construction
Portal Siting Area 44			
C	Rural, residential, and forested, adjacent buildings to the northwest and southwest	On steep slope uphill to the east	Adjacent residences
D	Rural, residential, and forested, no apparent buildings immediately adjacent to property	Western portion flat; eastern 0ne-third of site slopes slightly uphill to the east	Nearby residences.
E	Rural and residential to the south and west with open space to the north and forested to the east	Moderate slope uphill to the west, on higher ground than NE 195th St. and adjacent residences	Adjacent buildings and residences to the north, west, and south.
Portal Siting Area 41			
A	Commercial—office park	Flat	Nearby businesses
C	Commercial—office park to the north, south, and west, residential to the east, ball field to the southwest	Moderate uphill to the east, steep uphill just offsite to the east	Nearby business
D	Commercial—office park, sports field to the west, grassy park area to the northeast	Flat	Nearby businesses
X	Urban commercial	Flat	Nearby businesses
W	Residential with some open space	Slopes uphill to the west	Nearby residences
J	Commercial-office park	Flat	Nearby businesses
Portal Siting Area 5			
B	Commercial to the north, northeast and southeast along Ballinger Way NE, residential to the south and west	Gentle uphill to the northeast	Nearby businesses
G	Commercial to the north, northwest, and southeast along Ballinger Way NE, residential to the south and west	Gentle uphill to the northeast	Nearby businesses
X	Commercial to the north and southeast along Ballinger Way NE, residential to the south and southwest	Gentle uphill to the north	Nearby businesses

Table 5-12. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Route 9 Corridors (cont.)

Candidate Portal Site	Adjacent Land Use	Topography	Potential Areas Affected by Dust Created During Construction
Portal Siting Area 19			
A	Industrial facility to the west, residential to the south and east, wooded area to the north	Moderate uphill slope to the east	Nearby businesses; potential for exposing contaminated soil
C	Industrial facility to the northwest, residential to the south, southeast, and Puget Sound to the west, wooded area to the northeast	Flat and barely above sea level with steep uphill slope just offsite to the east	No impacts likely; however, potential for exposing contaminated soil
E	Residential to the north, south, and east, Puget Sound to the west	Flat	Nearby residences; potential for exposing contaminated soil
228th Street Corridor			
Portal Siting Area 11			
Same as 195th Street Corridor			
Portal Siting Area 44			
Same as 195th Street Corridor			
Portal Siting Area 41			
Same as 195th Street Corridor			
Portal Siting Area 39			
B	Rural residential west, south, and east. Office buildings across 228th St. SE to the north; light industrial (see Chapter 11)	Gentle slope with hill rising to the east	Nearby residences and buildings
C	Rural residential surrounding the site	On hillside	Nearby residences
D	Rural residential with an adjacent building north	Gentle slope	Nearby residences
Portal Siting Area 33			
A	Rural residential area with some trees to the north and east	Moderate slope uphill to west	Nearby residences
C	Rural residential with some trees	Mostly flat	Nearby residences
D	Rural residential with some trees	In valley	Nearby residences

Table 5-12. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Route 9 Corridors (cont.)

Candidate Portal Site	Adjacent Land Use	Topography	Potential Areas Affected by Dust Created During Construction
Portal Siting Area 26			
A	Residential with open space to the south	Hill to the east, relatively flat north, south, and west	Residences and buildings to the east, north, west, and southwest.
C	Commercial to the north, south, and west along SR-99, residential to the east	Gentle slope uphill to the northwest, surrounding area is free of large hills	Nearby businesses and residences
D	Residential to the north, west, and south, ball field to the southeast and trees to the east	Hill to the east, relatively flat to the north, south, and west	Nearby residences to the east, northwest, and southwest
Portal Siting Area 19			
Same as 195th Street Corridor			

Portal 41 Influent Pump Station Option

Impacts related to construction of the influent pump station (IPS) at Portal 41 would be similar to those identified for portal construction. However, the clearing of an additional 2 acres for the IPS has the potential to increase the amount of fugitive dust and emissions from construction equipment and vehicle at the site. These increased emissions would occur in the first 2 years of construction at Portal 41.

Locating the IPS at Portal 41 would result in a corresponding reduction in fugitive dust and vehicle and equipment emissions during construction at the Route 9 site.

Connections to the Existing Wastewater System

Construction impacts related to connections to the existing wastewater system would be from open-cut excavation, microtunneling, pipe installation, and construction of diversion and drop structures. Construction impacts on air quality would be similar to those impacts described for portal construction but on a significantly smaller scale. The diversion structures would be generally less than 500 square feet, and the drop structures would be located within the portals.

During connections to the existing sewers, odorous air may escape from the existing collection system for a short period of time while the existing pipes are modified to divert flows to the Brightwater System.

Operation Impacts: Route 9 Conveyance

Primary Portals

The Route 9 corridors include both influent pipelines carrying untreated wastewater to the treatment plant and effluent pipelines carrying treated wastewater from the treatment plant to the outfall. Influent would be conveyed by gravity the entire length of the corridor to the treatment plant. More stringent odor control equipment and monitoring (as described earlier for treatment plant construction mitigation common to all systems) would be required along the influent pipeline, because the likelihood of odor would be greater from untreated wastewater within the influent pipelines. Because the effluent has been treated and disinfected, it would not likely be odorous.

In the absence of odor control equipment, uncontrolled odor emissions could occur at any of the hydraulic structures listed in Table 5-13. As part of the design of these hydraulic structures, however, odor control equipment would be installed to minimize emissions of odorous compounds to the atmosphere. Appendix 5-B, Odor Analysis: Conveyance, provides detailed information on features of each conveyance facility that could contribute to odors and the technology that would be used for odor control.

Candidate Portal Sites in Portal Siting Area 11. Sites A and B in Portal Siting Area 11 are located adjacent to the existing Kenmore Pump Station in an industrial/commercial area. Sites A and B would have the shortest connections between the existing interceptor and the proposed influent tunnel. Site C would require more construction in streets and more underground structures to divert flows from the Kenmore Pump Station to the portal. Sites A and B are well suited for installation of new odor prevention equipment because they can be integrated into the existing pump station facilities and would be the furthest from residential areas. Two-stage scrubbing would be required at Portal Siting Area 11 regardless of the site selected.

Candidate Portal Sites in Portal Siting Area 41. Candidate portal sites at Portal Siting Area 41 are located near commercial areas in a business park setting. Two stage scrubbing would be required to control potential odor emissions. The impacts of the proposed drop structure and odor prevention equipment would be similar for all sites.

Table 5-13. Odor Control for Proposed Hydraulic Structures in Primary Portal Siting Areas on the Route 9 Corridors

Primary Portal Siting Area	Hydraulic Structure	Approximate Location	Odor Control
195th Street Corridor			
11	Drop structure and diversion structure	Near Existing Kenmore Pump Station NE 175th Street and 68th Avenue NE City of Kenmore	Yes
41	Drop structure and diversion structure Influent pump station (option)	Near intersection of NE 195th Street and 120th Avenue NE City of Bothell	Yes
44	Drop structure	Near intersection of NE 195th Street and 80th Avenue NE City of Kenmore	Yes
5	Transition structure	NE 205th Street and Ballinger Way NE City of Shoreline	Yes
19	Pressure Transition structure	NW 205th Street and Richmond Beach Drive NW Unincorporated Snohomish County	No
228th Street Corridor			
11	Same as 195th Street Corridor		
41	Same as 195th Street Corridor		
44	Same as 195th Street Corridor		
33	Pressure manhole	228th St. SW and Locust Way City of Brier and Unincorporated Snohomish County	No
39	Pressure manhole	228th St. SE and 31st Ave. SE City of Bothell	No
26	Transition structure	228th St. SW and Lakeview Dr. City of Mountlake Terrace	Yes
19	Same as 195th Street Corridor		

Candidate Portal Sites in Portal Siting Area 44. The candidate portal sites in Portal Siting Area 44 are mostly located in semi-rural areas. Two-stage carbon scrubbers are proposed for this portal. The impacts of the proposed drop structure and odor prevention facilities would be similar for all sites.

Candidate Portal Sites in Portal Siting Areas 5 and 26. Portal 5 and 26 are associated with the high point in the effluent tunnel. These portals would require air handling facilities to allow air to flow in and out of the effluent pipe. Carbon scrubbers would be provided to treat any air that may outgas from these portals. The impacts of the proposed portal and air handling facilities would be similar for all candidate portal sites. All candidate portal sites in Portal Siting Area 5 are in commercial areas. Sites A and C in Portal Siting Area 26 are located in residential areas.

Candidate Portal Sites in Portal Siting Areas 33 and 39. Portals 33 and 39 would consist of pressurized manholes sealed to the atmosphere. The manholes are designed to withstand the air pressure associated with the effluent tunnel. The air could not escape through the manholes and therefore there would be no air quality impacts associated with these manholes.

Candidate Portal Sites in Portal Siting Area 19. Portal 19 would include a pressurized transition structure and monitoring station. There would be no air impacts associated with these facilities because the structure would be sealed.

Secondary Portals

Secondary portals are not expected to be used and would not have operation impacts. If they were used, the final facility could include a manhole, which would be pressurized or sealed so that no air would escape from the system.

Portal 41 Influent Pump Station Option

Locating the Influent Pump Station (IPS) at Portal 41, rather than at the Route 9 treatment plant site, would add another potential source for odors at the portal site that would require treatment. The IPS and Portal 41 odor prevention equipment would be consolidated into one facility. The IPS/Portal 41 odor prevention facility would be designed with a two-stage chemical scrubber followed by a carbon scrubber. Chemicals would be injected into the wet well to minimize sulfide generation in the force main between the IPS and the treatment plant headworks. If the IPS were to be located at Portal 41, one potential odor source at the Route 9 site (the IPS) would be eliminated.

The IPS at Portal 41 would be equipped with a primary power feed from the local utility and either a second independent power supply from the local utility and/ or emergency standby fossil-fueled generators. Standby generators would be tested once per month to ensure proper working condition. During testing and emergency use, there is a potential for minor odor and emissions associated with the burning of fossil-fuels.

Connections to the Existing Wastewater System

Connections to the existing would be at Portals 11, 44, and 41. No additional odor impacts beyond those described above are expected from the connections at these sites.

Proposed Mitigation: Route 9 Conveyance

Mitigation for the Route 9 conveyance corridor would be as described earlier for conveyance mitigation common to all systems.

5.3.2.3 Outfall: Route 9

Impacts and mitigation for construction and operation of the outfall for the Route 9 systems would be as described above under Impacts and Mitigation Common to All Systems.

5.3.3 Impacts and Mitigation: Unocal System

5.3.3.1 Treatment Plant: Unocal

Construction Impacts: Unocal Treatment Plant

As described earlier under construction impacts common to all systems, demolition and construction-related activities for the treatment plant would cause short-term, local increases in levels of particulate matter as a result of fugitive dust emissions. These impacts would be greater at the Unocal site than at the Route 9 site because of the much higher quantities of excavation at the Unocal site (see Chapter 4 for excavation quantities). Best management practices, as described above for Proposed Mitigation Common to All Systems: Treatment Plant, would be used to minimize dust emissions. These practices include covering or wetting stockpiled soils and cleaning the tires and undercarriages of construction vehicles before they enter public streets.

The greatest potential for air emissions from construction at the Unocal site would be emissions of contaminants present in groundwater or soil at the site. As discussed above in the Affected Environment section, these contaminants (which would be classified as TAPs or HAPs under applicable regulations) could volatilize or disperse into the air if the soil or groundwater were disturbed. Cleanup of the contamination at the Unocal site could follow two scenarios:

- Unocal could clean up all known contamination according to Ecology's requirements before selling the site to King County
- King County could purchase the site and take over responsibility for site cleanup

If Unocal were to clean up the site prior to sale, emissions of these contaminants would not take place during treatment plant construction because the contamination would have been removed prior to the King County's acquisition of the site. Because a decision has not yet been made regarding timing and responsibility of site cleanup, potential impacts are discussed in this section.

Information on concentrations of soil contaminants is available for the Unocal site (see Chapter 4 and EMCON 1998 reference). Portions relevant to air quality are summarized in this section. Tests were performed in 2001 on soil samples from the Unocal site for several categories of total petroleum hydrocarbons (TPHs); for benzene, toluene, ethylbenzene, and xylenes (BTEX); and for polycyclic aromatic hydrocarbons (PAHs). Table 5-14 presents the results of soil sampling. Included are four samples: one with the highest concentration in the diesel range (designated as "maximum D" in the table); one with the highest concentration in the gasoline range (designated as "maximum G"); one with a moderate or "medium" concentration (but not an average); and one with a low concentration.

Table 5-14. Contaminants Present in Unocal Site Soils August-October 2001

Contaminant	Maximum D (mg/kg)	Maximum G (mg/kg)	Medium (mg/kg)	Low (mg/kg)
TPH-Diesel Range (DRO)	35,100	2830	1320	254
TPH-Heavy Oil Range (HO)	10,900	1790	1040	214
TPH-Gasoline Range (GRO)	147 J	2060	363J	8.93 J
Benzene	<0.0600	1.36 J	0.0681	<0.0300
Ethylbenzene	0.169	17.1	0.551	<0.0500
Toluene	<0.100	<1.00	<0.0500	<0.0500
Total Xylenes	1.01 J	31.4	1.44	<0.100
Benzo(a)pyrene	<0.028	<0.0055	0.057	0.025
Benzo(a)anthracene	0.24	0.12	0.098	0.034
Benzo(b)fluoranthene	<0.030	<0.0060	<0.0060	<0.0012
Benzo(k)fluoranthene	<0.040	<0.0080	<0.0080	<0.0016
Chrysene	1.3 J	0.24	0.16	0.1
Dibenzo(a,h)anthracene	<0.035	<0.0070	<0.0070	<0.0014
Indeno(1,2,3-cd)pyrene	<0.048	<0.0095	<0.0095	0.02

Source: Maul Foster and Alongi (2002)
"J" = qualifier indicating estimated value
"D" = diesel
"G" = gasoline

Because of the presence of the contaminants listed in Table 5-14, excavation of soil at the Unocal site would likely result in air emissions of small amounts of BETX and PAHs. All of these pollutants are TAPs, as identified in PS Clean Air Regulation III and Ecology Regulation WAC 173-460. These regulations require an applicant for an air quality permit to demonstrate impacts less than the ASIL for each TAP potentially emitted. Because the

SQERs provided in WAC 173-460-080 (e) have been set at levels below the ASILs, it was assumed that emission rates below these levels would not be considered significant and that dispersion modeling would not be required to demonstrate compliance with the ASILs. For pollutants where emission rates appear likely to exceed the SQERs, dispersion modeling would be needed to determine whether the ASILs would be met, given the specific characteristics of the site.

Based on the contaminant levels shown in Table 5-14, only benzene and PAH appear to have the potential to exceed the SQERs. Thus, it is likely that air quality regulatory agencies would require dispersion modeling for benzene and PAH if site cleanup had not been completed before King County undertook construction of a treatment plant at the Unocal site. Dispersion modeling for these contaminants was not conducted for this EIS because the amount of contaminated material to be excavated and the period over which the excavation of this material would be completed (both critical factors in dispersion modeling) are not known at this time. This modeling would be conducted during permitting for the site, if required.

Operation Impacts: Unocal Treatment Plant

Odor Dispersion Modeling

Odor dispersion modeling was conducted for the Unocal site, as described for the Route 9 site. As with Route 9, both onsite and Paine Field meteorological data were used; however, because of the topographic characteristics of the Unocal site, onsite data resulted in generally higher concentrations of modeled pollutants than did the Paine Field data.

Based on the odor dispersion modeling, no odors would be detected offsite, even under worst-case conditions at all flows. Offsite areas are areas where the public has unrestricted access. Worst-case operating conditions are defined as when combinations of meteorological conditions (such as inversions and stagnant air, which tend to occur in the autumn and winter) coincide with peak odor releases from treatment processes (which tend to occur in the summer). In reality, the two events are not expected to occur at the same time. For the proposed option of a structural lid over a portion of the treatment plant, the area on the structural lid would be considered offsite, because the public has access to that area. Table 5-15 shows the results of the odor dispersion modeling. The maximum offsite concentration (1-hour peak adjusted for 3-minute “puff” conditions) of odor for the Unocal site operating at 36 mgd is 0.02 D/T (using onsite data) and 0.01 D/T (using Paine Field data). Comparing this to a detection threshold of 1 dilution to threshold (D/T) shows that the maximum offsite concentration is approximately 50 times less than the concentration required for an odor to be detected. The maximum offsite concentrations of hydrogen sulfide for the Unocal site operating at 36 mgd are 0.2 parts per billion by volume (ppbV) (using onsite data) and 0.1 ppbV (using Paine Field data). Comparing these concentrations to a detection threshold of 0.8 ppbV shows that the maximum offsite concentration is approximately 4 times less than the concentration required for hydrogen sulfide to be detected. The maximum offsite concentrations of ammonia for the Unocal site operating at 36 mgd are 0.68 ppbV (using onsite data) and 0.93 ppbV (using Paine Field data). Comparing these concentrations to a detection threshold of 2,800 ppbV shows that the maximum offsite concentration is approximately 3,000 times less than the concentration required for ammonia to be detected. As a result, no detectable offsite odors are expected to result from operation of the Brightwater treatment plant. The peak offsite concentrations for odor, hydrogen sulfide, and ammonia for all scenarios modeled are shown in Table 5-15.

Air Quality Dispersion Modeling

As described above, operation of the wastewater treatment plant would result in emissions of TAPs. The emission rate for each TAP was compared to an SQER identified in WAC 173-460-080 (e). The SQER can be used to demonstrate compliance with the applicable ASIL as an alternative to using dispersion modeling. If the expected emissions are below an SQER, no further air quality impact analysis is required in most cases. If the emissions are above the SQER, ambient air quality modeling is required.

Table 5-15. Estimated Peak Offsite Odor Concentrations for a 36-mgd, 54-mgd, and 72-mgd Treatment Plant at the Unocal Site

Parameter	Based on Onsite Meteorological Data	Based on Paine Field Meteorological Data	Initial Detection Threshold
36-mgd			
Odor (D/T)	0.02	0.01	1
H_2S (ppbV)	0.20	0.10	0.8[a]
NH_3 (ppbV)	0.68	0.93	2,800[a]
54-mgd			
Odor (D/T)	0.03	0.02	1
H_2S (ppbV)	0.30	0.14	0.8[a]
NH_3 (ppbV)	1.08	1.30	2,800[a]
54-mgd with structural lid			
Odor (D/T)	0.03	0.02	1
H_2S (ppbV)	0.30	0.14	0.8[a]
NH_3 (ppbV)	1.31	1.30	2,800[a]
72-mgd			
Odor (D/T)	0.04	0.02	1
H_2S (ppbV)	0.39	0.19	0.8[a]
NH_3 (ppbV)	1.51	1.48	2,800[a]

Table 5-15. Estimated Peak Offsite Odor Concentrations for a 36-mgd, 54-mgd, and 72-mgd Treatment Plant at the Unocal Site (cont.)

Parameter	Based on Onsite Meteorological Data	Based on Paine Field Meteorological Data	Initial Detection Threshold
72-mgd with structural lid			
Odor (D/T)	0.04	0.02	1
H_2S (ppbV)	0.40	0.19	0.8[a]
NH_3 (ppbV)	1.71	1.48	2,800[a]

[a] Thresholds based on recent work done by St. Croix Laboratories for Sacramento Regional Sanitation District (McEwen, personal communication, 2002).
D/T = dilution to threshold.
H_2S = hydrogen sulfide.
NH_3 = ammonia.
ppbV = parts per billion volume.

The estimated emission rates of 17 compounds from the Brightwater Treatment Plant would either exceed their respective SQERs or do not have SQERs. These compounds are acetaldehyde, acrolein, arsenic, benzene, cadmium, chloroform, chromium, ethylene dibromide, formaldehyde, methylene chloride, methyl chloroform, nitric oxide, polycyclic aromatic hydrocarbons (PAHs), tetrachloroethylene, trichloroethylene, xylene, and lead. These compounds were, therefore, modeled to determine their potential to exceed the ASILs. Because hydrogen sulfide is a TAP, emission rates from the odor modeling described above were also compared to the SQER for hydrogen sulfide. The hydrogen sulfide emission rates were less than the SQER; therefore, hydrogen sulfide would not exceed the ASIL at or beyond the treatment plant's fence line.

The results of the dispersion modeling (provided in full in Appendix 5-A, Odor and Air Quality: Treatment Plant) indicate that no compounds, except for chloroform, would exceed ASILs beyond the property line of the treatment plant at the Unocal site. The chloroform ASIL would be exceeded for both the 54-mgd and the 72-mgd plant at Unocal. As discussed above for the Route 9 site, an evaluation of the removal efficiency of the carbon and its feasibility as a control device for chloroform is currently being conducted. If it is not technically feasible to control chloroform to levels that meet the ASIL using carbon or some other control technology, then a second tier analysis would be conducted during the permitting process.

Proposed Mitigation: Unocal Treatment Plant

Mitigation for the Unocal site would be as described under Proposed Mitigation Common to All Systems: Treatment Plant.

5.3.3.2 Conveyance: Unocal

Construction Impacts: Unocal Conveyance

Primary Portals

Construction impacts for Unocal conveyance would be as described above under Impacts and Mitigation Common to All Systems: Conveyance. Potential impacts at specific primary portal locations are summarized in Table 5-16. Details on the impacts at primary portals and secondary portals are described in Appendix 5-C, Construction-Related Air Impacts: Conveyance.

Secondary Portals

Construction impacts for Unocal conveyance would be as described above under Conveyance Impacts Common to All Systems: Conveyance. Secondary portals are not expected to be used; therefore, no impacts are anticipated. However, if they were to be used, the impacts would be much less and for a much shorter period of time than the primary portals.

Connections to the Existing Wastewater System

Connections to the existing wastewater system are the same for the Unocal corridor as described for the Route 9 corridors.

Table 5-16. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Unocal Corridor

Candidate Portal Site	Adjacent land use	Topography	Potential Areas Affected by Dust Created During Construction
Portal Siting Area 3			
D	Residential with commercial to the north	Gentle slope to the southwest. Located in a depression	Nearby residences
E	Residential with commercial to the north	Gentle slope uphill to the south. Located in a depression	Nearby residences
F	Residential with trees to the north, east and west, rural residential to the south	Moderate slope uphill to southwest	Nearby residences

Table 5-16. Land Uses, Topography, and Potential Air Quality Impacts During Construction at Candidate Portal Sites in Primary Portal Siting Areas on the Unocal Corridor (cont.)

Candidate Portal Site	Adjacent land use	Topography	Potential Areas Affected by Dust Created During Construction
Portal Siting Area 7			
A	Residential, school to the north	Track and field in northeast corner raised (approx. height 20 ft) above baseball diamond and tennis court in west/southwest portion. Uphill slope to the northeast	Nearby residences
B	Residential, school to the northeast, ball field to the east, bog and park to the north	Sharp incline on southwest border	Nearby residences
C	Residential with some trees, school and ball field to the east, King County shop to the south	Varied, stream runs north to south dividing the park in half	Nearby residences
Portal Siting Area 11			
A	Light industrial and commercial area, commercial area has retail/business north of NE Bothell Way	Located in a low area on a gentle slope uphill to the northeast	Nearby businesses
B	Light industrial and commercial area, commercial area has retail/business north of NE Bothell Way	Located in a low area on a gentle slope uphill to the northwest	Nearby businesses
C	Urban commercial area surrounds site with residential area to northwest	Gentle slope uphill to the northwest	Nearby residences and businesses
Portal Siting Area 14			
A	Urban commercial (office park, industrial), ball field to the north	Flat	Buildings in surrounding office park, residences on the hill to the northeast, and along North Creek Pkwy. S.
B	Urban commercial (office park, industrial), ball field to the south	Flat	Buildings in surrounding office park, residences on the hill to the northeast, and along North Creek Pkwy. S.
D	Urban commercial (office park, industrial)	Flat	Residences on the hill to the east of 120th Ave. NE

Operation Impacts: Unocal Conveyance

Primary Portals

The Unocal corridor includes an influent gravity pipeline, pump station, and force main. There is no effluent pipeline for this alternative since the effluent is discharged directly to the outfall. Untreated wastewater would be conveyed by gravity to the pump station located in the vicinity of the existing Kenmore Pump Station at Portal 11 and pumped up to Portal 7, where it would then flow via gravity to the treatment plant. Because it is conveying untreated wastewater, odor control equipment and monitoring would be required along the influent pipeline. Table 5-17 lists primary portal siting areas along the Unocal corridor and key hydraulic structures at these areas; the table also indicates whether odor control would be provided at these portals. Odor control is not expected to be required if the portal is sealed and odorous gasses do not escape to the atmosphere.

Without odor control equipment, odor emissions could occur at any of the hydraulic structures listed in Table 5-17. Odor emissions could also occur at the pump station from release of hydrogen sulfide gas at the wet well. However, as part of the pump station design, King County would install odor control equipment to minimize emissions of odorous compounds to the atmosphere. The County’s commitment to odor control at the Unocal conveyance facilities would result in the removal of a high percent of hydrogen sulfide at the stack, the same as described above for Route 9 conveyance facilities. Appendix 5-B, Odor Analysis: Conveyance, provides detailed information on features of each conveyance facility that could contribute to odors and the technology that would be used for odor control.

Table 5-17. Odor Control for Proposed Hydraulic Structures in Primary Portal Siting Areas on the Unocal Corridor

Primary Portal Siting Area	Hydraulic Structures	Approximate Location	Odor Control
14	Drop structure and diversion structure	Near North Creek Pump Station, North Creek Pkwy. City of Bothell	No
11	Drop structure and diversion structure, pump station	Near Existing Kenmore Pump Station, NE 175th Street and 68th Avenue NE City of Kenmore	Yes
7	Force main discharge structure	Near intersection of Ballinger Way and 25th Avenue NE City of Shoreline	Yes
3	Manhole	SR-104 and 232nd Street SW City of Edmonds	No

Candidate Portal Sites in Portal Siting Area 14. Candidate portal sites in Portal Siting Area14 are located in a commercially zoned area with multiple business parks. The impacts of the drop structure and odor prevention facility would be similar for all sites.

Candidate Portal Sites in Portal Siting Area 11. The selected candidate site would need to accommodate a new pump station to pump flows from the existing Bothell-Kenmore interceptor to Portal 7, backup generator facilities, and odor prevention equipment. Sites A and B in Portal Siting Area 11 are located adjacent to the existing Kenmore Pump Station in an industrial/commercial area. Sites A and B would have the shortest connections between the existing interceptor and the proposed influent tunnel. Site C would require more construction in streets and more underground structures to divert flows from the Kenmore Pump Station to the portal. Sites A and B are well suited for installation of new odor prevention equipment because they be the furthest from residential areas. Two-stage scrubbing would be required at Portal Siting Area 11 regardless of the site selected.

Candidate Portal Sites in Portal Siting Area 7. All candidate portal sites in Portal Siting Area 7 are located in residential areas. The impacts of the force main discharge structure and odor prevention equipment would be similar for all sites. Three-stage odor scrubbers would be required.

Candidate Portal Sites in Portal Siting Area 3. Portal 3 would be a sealed manhole. There would be no air impacts associated with this manhole.

Secondary Portals

The impacts from secondary portals would be the same as described for the Route 9 alternative.

Connections to the Existing Wastewater System

The impacts from connections to the existing wastewater system would be the same as described for the Route 9 corridors.

Proposed Mitigation: Unocal Conveyance

Mitigation for the Unocal conveyance would be as described earlier for conveyance mitigation common to all systems.

5.3.3.3 Outfall: Unocal

Impacts and mitigation for construction and operation of the outfall for the Unocal System would be as described above under Impacts and Mitigation Common to All Systems.

5.3.4 Impacts: No Action Alternative

There would be no emissions of criteria air pollutants, odors, or toxic air pollutants related to the Brightwater Treatment Plant under the No Action Alternative. However, under the No Action Alternative, operating efficiencies within King County’s system would likely start to decline as capacities are reached. This could result in increased odor generation from existing wastewater facilities in the area because wastewater flows would increase with increased population growth. The potential for sanitary sewer overflows would also increase and each overflow would discharge odorous untreated wastewater. In addition, the potential for process upsets would increase because the treatment facilities would start to be overloaded. This could require removal of the contents of a soured digester or secondary process, for example, which could trigger an odor event at a facility (West Point or South Plant) that currently does not have the same level of odor control that the proposed Brightwater Treatment Plant would have. Please refer to Appendix 3-J, Evaluation of the No Action Alternative, for additional information on the No Action Alternative.

5.3.5 Cumulative Impacts

Air emissions from the construction and operation of Brightwater facilities would add to region-wide air pollutant emissions, incrementally increasing the potential for the region to revert to non-attainment status for criteria pollutants. The primary types of pollutants emitted by the facilities (oxides of nitrogen and volatile organic compounds) are those that, in combination with emissions from other regional sources, could contribute to the formation of ozone. Ozone, a criteria pollutant, is the primary constituent of photochemical smog.

For Route 9, there could potentially be cumulative impacts during the construction phase if the construction of the Route 9 widening were to concur with the construction of the treatment plant. The concurrent construction could potentially delay traffic on Route 9 and increase ambient levels of CO in the vicinity of the treatment plant. This impact would be temporary and is not expected to be significant. During operations, no cumulative odor or air quality impacts are anticipated. StockPot Soup, which is currently located on the site, may be relocated so that it would no longer be operating in the area and the odor emissions from StockPot Soup would be eliminated.

For Unocal, cumulative air quality impacts would only occur during operation of the plant with the lid concurrent with the Edmonds Crossing multimodal project. There would not be any odor or air quality construction phase cumulative impacts.

Emissions of criteria pollutants from the proposed Brightwater System would be well below the Prevention of Significant Deterioration (PSD) regulatory level of 250 tons per year (tpy). Emissions of any criteria pollutant greater than 250 tpy would be considered significant and would require a wastewater treatment plant to evaluate the impact of their emissions for compliance with the National and State Ambient Air Quality Standards.

The local air agency can request that facilities with less than 250 tpy perform dispersion modeling for ambient impact of a criteria pollutant if they believe there is potential for a significant impact. Because facility wide emissions of oxides of nitrogen for the 72-mgd treatment plant, which has the highest emissions of the proposed options, would be less than 44 tpy and emissions of volatile organics would be less than 6 tpy, criteria pollutants were not modeled and the proposed facility is not expected to significantly impact the formation of ozone in the region.

The Draft EIS for the Edmonds Crossing project (FHWA et al., 1998) evaluated only the air quality impact of carbon monoxide (CO) from mobile sources and at the predicted concentration of CO at three intersections around the project. It was determined that the Edmonds Crossing project would result in lower CO concentrations at the three intersections than the Edmonds Crossing No Action Alternative. Potential emissions of CO from the Brightwater Treatment Plant are expected to be less than 60 tpy for the 72-mgd treatment plant. As mentioned above, this is well below the PSD regulatory level of 250 tpy. The PSD regulation also defines significant impact levels for criteria pollutants for a project. Projects with impacts below this level are considered to have an insignificant impact on the surrounding airshed. CO emissions were modeled for the proposed 72-mgd treatment plant at Unocal; the ambient impacts were below the 500 microgram per cubic meter ($\mu g/m^3$) 8-hour level and the 2,000 $\mu g/m^3$ 1-hour significant impact level. Under PSD regulations, if the project is demonstrated to be less than significant, analysis of the cumulative effects, including effects of other existing and proposed projects, is not required. Therefore, the cumulative impacts of Edmonds Crossing and Brightwater would not be significant.

Because of the high level of odor control at the Brightwater facilities, no significant change from existing odor conditions is anticipated in the vicinity of the treatment plant.

5.4 Significant Unavoidable Adverse Impacts

There are no significant unavoidable adverse impacts to air quality associated with this project. Dispersion modeling indicates that there would be no adverse impacts from odors, criteria, toxic and hazardous air pollutants and that combustion sources would meet current emission standards. Chloroform impacts were predicted to be above the PS Clean Air's ASIL in all scenarios modeled for both treatment plant locations. Chloroform emissions above the ASIL are typical for wastewater treatment plants because of the chlorine used in drinking water that is eventually discharged to the wastewater system. A second tier analysis would be conducted for chloroform during the permitting process. The second tier analysis uses a health impact assessment instead of the ASIL. Because chloroform emissions are typically above the ASIL at wastewater treatment plants, it is common to do a second tier analysis. A second tier analysis is an optional procedure that uses a health impact assessment instead of ASIL. Following EPA approved methods, risks could be more accurately characterized by using updated EPA unit risk factors, inhalation reference concentrations, or other EPA-recognized approved methods. A second tier analysis includes a discussion of the demographics pertinent to assessing the public health risk, a brief review of the toxicological literature regarding chloroform, characterization of existing emissions and exposure pathways, and a quantitative estimate of the cancer risk to potentially exposed individuals. Generally, this assessment at other wastewater treatment plants has shown little to no health risks due to chloroform.

5.5 Summary of Impacts and Mitigation

Table 5-18 provides a summary of potential air impacts and mitigation measures for the Brightwater System alternatives.

Table 5-18. Summary of Potential Air Impacts and Proposed Mitigation for Brightwater Systems

Brightwater System	System Component	Impacts	Mitigation
Common to All Systems	Treatment Plant	Construction ∉# Construction activities for the plant have the potential to generate temporary particulate (dust) emissions from ground-disturbing work and combustion pollutants (primarily CO) from construction vehicles. ∉# Construction activities for the plant have the potential to generate release of contaminants (HAPs and TAPs) due to disturbance of potentially contaminated soils and/or groundwater.	Construction ∉# Construction management practices such as wetting and covering disturbed soils, washing tires and undercarriages of vehicles, vacuum-sweeping adjacent streets, and shutting off idling equipment would minimize air emissions. ∉# Perform cleanup of contaminated soils and groundwater before construction disturbs the contaminated areas. ∉# If ambient levels are above the SQERs dispersion modeling would be done to quantify impacts and develop a mitigation plan.
		Operation ∉# Without mitigation, odor-causing compounds present in untreated wastewater could result in emission of odors to offsite receptors. ∉# Without mitigation, emission of criteria pollutants in excess of regulated levels could result from onsite combustion sources (i.e., cogeneration facility). ∉# One TAP (chloroform) has the potential to exceed ASILs.	Operation ∉# Odor control equipment would remove 99.99% of hydrogen sulfide and 99.93% of the ammonia and 99.84% of the total odor at peak load conditions, resulting in no detectable off-site odor from treatment plant. ∉# All processes would be covered or enclosed and air vented for treatment in a 3-stage + carbon odor control system. ∉# Emissions of criteria pollutants would be controlled by BACT and would not cause violations of NAAQS. ∉# Further study will be done during design to determine whether chloroform emissions would be reduced through carbon adsorption. If carbon adsorption does not provide adequate mitigation, a second tier analysis would be conducted at a later stage of design to quantify risks and mitigate to the regulatory levels required. ∉# An odor reserve fund would be created to ensure that odor control goals are met. the fund would be used to augment the odor control system, if necessary, to meet the goal of no detectable odors at the property line.

Table 5-18. Summary of Potential Air Impacts and Proposed Mitigation for Brightwater Systems (cont.)

Brightwater System	System Component	Impacts	Mitigation
Common to All Systems (cont.)	Conveyance	<u>Construction</u> • Construction activities for conveyance have the potential to generate temporary particulate (dust) emissions from ground-disturbing work and combustion pollutants (primarily CO) from construction vehicles.	<u>Construction</u> • Construction management practices such as wetting and covering of disturbed soils and shutting off idling equipment would minimize air emissions.
		<u>Operation</u> • Portals and pump stations along the influent tunnels would, without mitigation, have the potential to generate odors.	<u>Operation</u> • Odor control equipment would remove a high percentage of hydrogen sulfide, resulting in no detectable odor from portals or pump stations.
	Outfall Zones	<u>Construction</u> • Construction activities for the outfall have the potential to generate temporary particulate (dust) emissions from ground-disturbing work and combustion pollutants (primarily CO) from construction vehicles. • Construction activities for the outfall have the potential to generate release of contaminants (HAPs and TAPs) due to disturbance of potentially contaminated soils and/or groundwater.	<u>Construction</u> • Construction management practices such as wetting and covering disturbed soils and shutting off idling equipment would minimize air emissions. • See Chapter 4 for discussion of measures to reduce impacts if contaminated substances are encountered during construction at outfall sites.
		<u>Operation</u> • No impacts to air quality are expected.	<u>Operation</u> • No mitigation would be required.
Route 9–195th Street System	Treatment Plant	<u>Construction</u> • Same impacts as discussed under Common to All Systems.	<u>Construction</u> • Same mitigation as discussed under Common to All Systems.
		<u>Operation</u> • As described under Common to All Systems, potential for odor would exist without mitigation. With mitigation, maximum offsite hydrogen sulfide concentration would be well below threshold of detection.	<u>Operation</u> • Same mitigation as discussed under Common to All Systems.
	Conveyance	<u>Construction</u> • Same impacts as discussed under Common to All Systems.	<u>Construction</u> • Same mitigation as discussed under Common to All Systems.

Table 5-18. Summary of Potential Air Impacts and Proposed Mitigation for Brightwater Systems (cont.)

Brightwater System	System Component	Impacts	Mitigation
Route 9–195th Street System (cont.)	Conveyance (cont.)	Operation ∉ Same impacts as discussed under Common to All Systems.	Operation ∉ Same mitigation as discussed under Common to All Systems.
	Outfall	Construction ∉ Same impacts as discussed under Common to All Systems.	Construction ∉ Same mitigation as discussed under Common to All Systems.
		Operation ∉ Same impacts as discussed under Common to All Systems.	Operation ∉ Same mitigation as discussed under Common to All Systems.
Route 9–228th Street System	Treatment Plant	Construction ∉ Same as Route 9–195th Street System.	Construction ∉ Same as Route 9–195th Street System.
		Operation ∉ Same as Route 9–195th Street System.	Operation ∉ Same as Route 9–195th Street System.
	Conveyance	Construction ∉ Similar to Route 9–195th Street System, except that impacts would be slightly greater due to larger number of portals.	Construction ∉ Same mitigation as discussed under Common to All Systems.
		Operation ∉ Similar to Route 9–195th Street System.	Operation ∉ Same mitigation as discussed under Common to All Systems.
	Outfall	Construction ∉ Same as Route 9–195th Street System.	Construction ∉ Same as Route 9–195th Street System.
		Operation ∉ Same impacts as discussed under Common to All Systems.	Operation ∉ Same mitigation as discussed under Common to All Systems.

Table 5-18. Summary of Potential Air Impacts and Proposed Mitigation for Brightwater Systems (cont.)

Brightwater System	System Component	Impacts	Mitigation
Unocal System	Treatment Plant	<u>Construction</u> ✐ Same impacts as discussed under Common to All Systems. ✐ Higher levels of dust and CO may be emitted at Unocal than at Route 9 due to the higher volume of earth that would be removed and the greater number of truck trips. Construction activities have potential to generate release of contaminants (HAPs and TAPs) due to disturbance of potentially contaminated soils and/or groundwater.	<u>Construction</u> ✐ Same mitigation as discussed under Common to All Systems. ✐ If King County assumed ownership before cleanup of contaminated soils took place, dispersion modeling would be done, if required, to quantify potential impacts and develop a mitigation plan.
		<u>Operation</u> ✐ Similar to Route 9; due to site-specific meteorology and topography, maximum offsite hydrogen sulfide concentration would be higher than Route 9, but still below the detection threshold.	<u>Operation</u> ✐ Same mitigation as discussed under Common to All Systems.
	Conveyance	<u>Construction</u> ✐ Similar to Route 9–195th Street System, except that impacts would be slightly less due to smaller number of portals.	<u>Construction</u> ✐ Same mitigation as discussed under Common to All Systems.
		<u>Operation</u> ✐ Same impacts as discussed under Common to All Systems.	<u>Operation</u> ✐ Same mitigation as discussed under Common to All Systems.
	Outfall	<u>Construction</u> ✐ Same impacts as discussed under Common to All Systems.	<u>Construction</u> ✐ Same mitigation as discussed under Common to All Systems.
		<u>Operation</u> ✐ Same impacts as discussed under Common to All Systems.	<u>Operation</u> ✐ Same mitigation as discussed under Common to All Systems.

Table 5-18. Summary of Potential Air Impacts and Proposed Mitigation for Brightwater Systems (cont.)

Brightwater System	System Component	Impacts	Mitigation
No Action Alternative	Treatment Plant	Construction - No construction would take place, and no air impacts would occur.	Construction - No mitigation would be required.
		Operation - No additional emissions would occur as a result of the Brightwater System; however, overloading of existing facilities could result in increased odor and air emissions.	Operation - Upgrades to odor control systems in the conveyance system and existing treatment plants to handle the additional odor loading from the increase in flows. Provisions to manage increase in sanitary sewer overflows and potential resultant odor events.
	Conveyance	Construction - No construction would take place, and no air impacts would occur.	Construction - No mitigation would be required.
		Operation - No additional emissions would occur as a result of the Brightwater System; however, reduced efficiencies and process upsets caused by overloading of existing facilities could result in increased odor emissions.	Operation - No mitigation would be required.
	Outfall	Construction - No impacts would occur.	Construction - No mitigation would be required.
		Operation - No impacts would occur.	Operation - No mitigation would be required.

5.6 References

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